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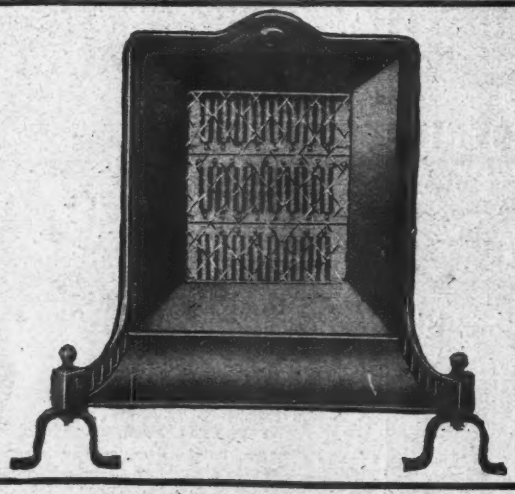

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1916: A BACKWARD GLANCE.

As we enter upon the year 1917 there is abroad amongst Britain and her Allies a spirit of quiet confidence, of assurance in increasing strength, and of expectation of a victorious conclusion of the war before another winter passes. Our inclination just now is not so much to look backward as to look within for our state of preparedness and forward to the heavy tasks that still await us all. Yet 1916 must not be allowed to pass out of mind with its praises all unsung, for it has been a year of grand achievement. No hasty phrases can pay fitting tribute to the magnificence of the Fleet—whether in Jutland Battle or in silent watchfulness; to the unexampled fortitude, self-sacrifice, and valour of the land Forces, shaking the German *moral*; or to the resourcefulness and daring of our heroes in aerial flight. Nor can we in few words make more than the barest suggestion of the immense nature of the organisation and reorganisation of our productive powers in factories at home and abroad. Are we not now approaching the full utilisation of all our forces and resources for the "knock-out blow" which is to bring in a Peace which shall be lasting? If 1917 is to be the decisive year, we believe that from many standpoints history will regard 1916 as almost equally momentous.

The manufacture of munitions of war in thousands of works throughout the British Empire has made such demands upon engineering genius and skill as to have demonstrated for all time the essential nature of the engineering profession and industries of the nation. And the part that electricity and its applications have performed in this connection, though only partly known at present, will remain for ever a monument in honour of the usefulness of the electrical engineer. Assuredly the war has raised the status of all branches of engineering—may the nation not be slow to recognise the fact, and register it with appropriate action!

The year that has gone, however, has not only been one of continued organisation for the purposes of war, for deliberations and investigations begun in the Press, and carried on in many directions ever since August, 1914, have become focused in committee-rooms where, at the bidding of the Government, experts have been inquiring into the details of our great industries and the measures necessary for safeguarding their interests after the war. The sittings have not yet been concluded, for the inquiries have been no light undertaking, but engineering, electrical, and other trades have all been preparing their suggestions with regard to the future. One of the Governmental Committees has urged the setting up of additional financial facilities in the form of a Trade Bank to assist our industries. The Economic Conference at Paris has formulated the Allies' after-the-war policy. The Institution of Electrical Engineers courageously leaving the beaten path of its quondam "professional" virtue has elaborated an excellent trade policy. The large industrial concerns have been "getting together" in federated association. Electrical and other engineering trade associations have been actively pursuing the same worthy object. The Board of Trade has made changes in its Intelligence Services, and the appointment of new Ministers of Shipping and Food has relieved it of some of its overload of work. Capital and Labour have made advances toward each other in the interests of industrial harmony. Yet, notwithstanding all our

preoccupation with actual war work, and with all these efforts at industrial and trade reorganisation, individual manufacturers have been able to lay the foundations for special lines of manufacturing, and, besides meeting the exceptional needs of war factory installations at home, have admirably maintained the value of our electrical and allied exports at a figure which, but for restricted tonnage accommodation, labour, and material, would have been multiplied several times, so great has been the demand of the world.

The intense activity of our industries in general has caused the demand for electric power to multiply and increase far beyond even the high record of 1915, and has thus reacted upon the electricity supply industry, which has been hard put to it to keep pace with the growing load; the nation's grateful thanks are due to the station engineers, who, short-handed as to staff and starved as to capital, have manfully contended against unprecedented difficulties and have almost invariably succeeded in maintaining an adequate supply of energy. Those undertakings which are situated in manufacturing districts have recorded outputs of energy breaking all records, and in many cases substantial profits have been made; large stations have been hastily extended, and some small stations, which never anticipated anything in the nature of a power load, have awakened to find themselves equipped with three-phase turbo-alternators and badges, and a 24-hour load. That the war activities of the supply stations will secure for them the confidence of power users and generate a momentum which will ensure to them a permanent and substantial development cannot be doubted.

The spirit of co-operation for patriotic ends, which has pervaded the industrial councils of the nation since the outbreak of war, has made itself felt in the electricity supply industry to good purpose, and has brought into existence a movement which under ordinary circumstances might have perished at its birth—the movement towards the interconnection of electricity supply undertakings, which was initiated in the Institution of Electrical Engineers, developed by the Lancashire and Cheshire Committee, and immensely invigorated by the unexpected support of the Board of Trade. Under the ægis of the I.E.E., the I.M.E.A., and the I.A.E.P.C., the scheme has gathered strength, and several district committees have been formed to carry it into effect; but little open opposition has been manifested, and the technical difficulties, which admittedly exist, are not incapable of solution by the men who have the matter in hand, while the Treasury has promised to assist in providing the necessary funds.

The spirit of co-operation, as indicated by the last remark, has extended to Government circles also, and we gladly recognise again the striking change of attitude adopted by our rulers towards industry in general. The Committee of the Privy Council, guided by its Advisory Council for Scientific and Industrial Research, and backed up by the Treasury, has recently declared its intention to devote comparatively large sums to the promotion of research and similar purposes, in consultation and collaboration with representative trade associations—a significant indication of the new spirit that sways the Government. The admirable work of the National Physical Laboratory has also been generously acknowledged by the Council, and we may count upon its future development with adequate financial support from the State—which it never had until the war broke out.

Committees have been appointed to consider the position of science in schools and universities, and to reform the curricula adopted by the Civil Service Commissioners, and we trust that they will ruthlessly sweep away antiquated notions and remove the fetters which have so long enthralled our schools. During the year good progress has been made in the electrification of several important railways, and in presence of the shortage of petrol the electric vehicle has had an exceptional opportunity to display its qualities—marred only by the difficulty of obtaining it. We have for many years advocated the use of electricity in agriculture, and the favourable reception accorded to Mr. W. T. A. Kerr's account of his experiences in this connection, at the I.M.E.A. meeting, fills us with hope for future progress.

We have only lightly touched on some of the outstanding operations of the year in the foregoing, recognising that no one nowadays has leisure to indulge in detailed retrospection; but we have said sufficient to indicate how important and interesting have been the movements and tendencies of 1916. In the New Year we shall doubtless witness progress on very similar lines, placing us in a better state of preparedness for the period of Peace, which will not now, we hope, be long delayed.

German Companies in Russia.

A REPORT on this subject has been published by the German banking institutions which formerly offered for subscription shares in the Russian A.E.G. and other electrical companies in Russia. The report is based upon a statement made in a Russian newspaper concerning a recent meeting of the "Special Commission for Combating German Domination." It appears that the Commission had under discussion the question of removing German influence from the Siemens and Schuckert Co., Siemens & Halske, the A.E.G., the Electro-Peredatscha, and the Petrograd Electric Lighting Co. of 1886. The representative of the Ministry of Commerce submitted three proposals by which the problem could be solved, namely, liquidation, purchase by the State, or participation of the Government in the companies so as to exercise the requisite supervision.

The Commission decided in favour of the liquidation of the five companies, and the preparation of a definite scheme for this purpose was left to the liquidators to be appointed. The general principles of the scheme, however, were outlined by the Commission. According to these, the bearer shares in all the companies are to be abolished and replaced by registered shares. The holders of the former will be entitled to apply for an exchange for registered shares, but only those who are not suspected of having relations with German capital will be permitted to effect the transfer. All the remaining shares will be purchased by the Government at the nominal prices, and will either be retained by the Government, which in this way will become interested as a shareholder, or they will be sold by the State at their quotation value as registered shares. It would be a good thing for our future electrical trading operations in Russia if British holders could be found for some of the German electrical investments. It is stipulated that the liquidation of the five companies must be ended by July 1st, 1917.

The German banking institutions, in commenting on the above statement, remark that further information as to the extent to which these proposals are being carried out is lacking. The adoption of the scheme, it is held, would deprive German shareholders of their rights as such, and render them dependent upon a claim on the Russian Government for an amount corresponding to the nominal value of their shares. It is intended to lodge a protest against the scheme, and to take all necessary steps for the representation of German shareholdings, and for this purpose German holders are notifying their shares to the banks concerned, which include the Disconto Gesellschaft, of Berlin.

THE SUPERFLUITY OF ELECTRICITY REGULATIONS.

[COMMUNICATED.]

ELECTRICITY supply suffers from too many regulations; gas supply does not. It is not because gas is such an inoffensive sort of thing; the Board of Trade inquiries into railway disasters where people are roasted to death, owing to the use of gas for lighting purposes, prove the contrary. The electrical industry has been foolish enough to burden itself with all the safeguarding measures and their cost, whilst the gas industry allows compo tubing to be run in any manner, and it is consequently much cheaper to install. If a person is blown through a window owing to bringing a naked light near to a leakage of gas, the verdict is "What a stupid thing to do!" If a house is destroyed through a leakage of gas being ignited by an electric spark, the verdict is "Fire caused by fusion of an electric wire," and the public exclaim "What a dangerous thing electricity is!" After 20 years' experience, the writer has never known an electric spark do £5 worth of damage, provided there was no gas leakage. Verily we deserve what we get in the way of blame that should not be ours by right. Do not the regulations say: "Thou shalt earth all tubing, covers, and the like; thou shalt not go near any gas pipes or fittings; thou shalt completely cover up thy fuses"?—all to save people from the effects of a leakage of gas. The electrical industry should say: "We are out for all the business we can get; all rules will be abolished forthwith; and if a complaint is received about a person getting a shock, he will be informed that he should not have been so silly as to touch the thing; or if the complaint is that a house is burnt down, he will be advised not to have gas in his new house at all." The gas industry would then have to run iron tubing covered with insulating material, and put insulating connectors between the gas meter and the tubing.

Each electricity supply authority used to make its own rules, and the confusion was awful. A contractor doing work in a strange town had to go to extra trouble and expense to conform with the local fads. Nowadays most supply authorities accept the I.E.E. wiring rules, the Board of Trade regulations, and the Factory Acts. The official who has to study all these regulations and pass work accordingly, has got his work cut out if they are all to be adhered to. In passing a job he has to consider whether a certain part of the work is covered by the I.E.E. rules, the Board of Trade, or the Factory Act. He even has to consider special regulations insisted on by insurance companies. Now, this state of things is unfair to the inspector, the contractor, the manufacturer, and the general public. If scores of rules are necessary, let them at least be issued by one authority; let the Board of Trade be that authority, and let the rules be issued in three sections. The first section should deal with the supply authority and private generating stations; the next with workshops of all descriptions; the last should deal with private houses, shops, and offices.

In order to greatly diminish the number of rules, why not deal with electrical wiring apparatus in the same way as meters are dealt with? A new type of meter is submitted to the Board of Trade and, if satisfactory, has their approval stamped on it. Let the lampholder, switch, wall socket, &c., be stamped "B.O.T.," and let new designs be submitted before being placed on the market. If this idea were carried out, the inspector's duties would be reduced to looking out for faulty workmanship. Arguments as to the length of break of fuses or switches would vanish. The public would also probably get more standardised articles, as a manufacturer would prefer to make to a standard design rather than ask for permission to make, for instance, a wall-plug having its pins ½ in. further apart than any one else's.

Rules are too numerous, and, owing to the system of inspection, are not all kept. The bulk of the work is left to the supply authority's inspector, who receives no help from any of the people who make the rules. The Board of Trade could take over the whole business of inspection, and the certificate of the local B. of T. inspector would satisfy the supply authority and the insurance companies, who could dispense with their inspectors.

BAKING BY ELECTRICITY.

BY G. BASIL BARHAM.

WHEN the possibilities of baking on a large scale by electricity were first discussed, it was the general consensus of opinion that the idea was impracticable. The electric ovens then on the market were far from efficient, and with energy at a comparatively high price, there seemed to be no possibility of electricity supplanting steam, coal, or gas in the bakery.

Even at that time, however, small electric ovens were demonstrating the possibilities which existed, and proving that electric cooking was not the expensive luxury that many considered it to be. Experiments were made with a view to improving the efficiency of the electric oven, and certain Continental manufacturers of electrical appliances devoted large sums of money for the purpose of developing electric cooking apparatus. One of the big German firms realised that the chief stumbling-block in the way was the cost of energy, and at once adopted different tactics to its competitors. It increased the size of elements, worried but little about efficiency, set to work to build ovens of large size, and sent an army of agents to push their sale in countries where electricity was the cheapest possible form of power, such as Norway, Sweden, and, more particularly, Switzerland. Few engineers are aware that in that country are some of the largest electric cooking installations in existence.

ELECTRIC BAKERIES.

As the writer pointed out some little time ago, the convenience, cleanliness, and great range of regulation possible with electricity are so great as to constitute powerful arguments in favour of electrically-heated bakehouses, even in localities where electricity costs money and cannot be obtained for next to nothing.

There is a large electric bakery in Bregenz, Switzerland, which has a baking surface of about 6 ft. 7 in. by 19 ft. 8 in., or about 14 sq. yards. This surface is, however, divided into two storeys, placed one above the other. The controlling switches are mounted on a switchboard placed beneath the doors of the oven, and shielded from the heat by a protective screen. Each of the two storeys of the oven is controlled by 10 switches, which are so arranged that their positions on the board correspond to the positions in the ovens of the heating elements they control. The elements are so arranged that when they are all in operation the heat is very evenly distributed, and a careful temperature test will show no difference in heat between any two parts of the oven. It can therefore be seen that, with 20 circuits for the two storeys, the heating can be adjusted within very wide limits, and it is possible not only to reduce it from full to zero all over the oven, but also to raise any desired parts of the latter to a high local temperature, whilst the remainder of it continues comparatively cool. As may be supposed, ordinary thermometers are useless, and in order to show the temperature inside, pyrometers are fitted in the front of the oven. The oven is lighted electrically by means of incandescent lamps, but as the bulbs of these would not stand the heat were they fixed inside the oven, openings are provided at the right-hand side of the doors. An electrically-heated steaming apparatus is provided on each storey, as steam is required when dealing with certain kinds of bread, and in connection with the ovens a large water tank has been installed, which supplies all the hot water needed for the domestic operations carried on in the adjoining house as well as that required in the bakery itself.

PRIVATE BAKERIES.

Anyone who has not devoted close attention to the subject would be surprised to know what immense strides have been made in the direction of equipping what I may term private bakeries with electric ovens. The majority of large hotels and restaurants do all their own cooking, including the baking of bread and pastry, and in many of them electric ovens, specially designed for their needs, are installed. At the same time, it need not be supposed that the demand has already been filled. As a matter of fact,

the demand has not yet been stimulated, and there is a vast field open to the firms who care to undertake its cultivation.

One of the first questions that the hotel or restaurant proprietor or manager will raise when approached on the subject, is that of the relative costs of electricity, coal, and gas.

The popular impression is that electricity is expensive, and the hotel man fears he will find himself face to face with the prospect of higher fuel bills. Generally speaking, one does nominally pay a higher rate for electricity. This is only one phase of the question, however, and before deciding that he cannot afford electricity in his bakery, the prospective customer should be shown that the cost of fuel is only one item in the expense of the bakery. It has been pointed out that the first consideration in the installation of a bakery in an hotel is the amount of space required for it, and the possible location, and here is just the beginning of the electrical advantages. If electricity is to be used, much less space is required. Electric ovens can be built with three or four decks or compartments, giving several ovens of equal capacity in a space where only one deck of any other class could be placed. In the large city hotels this consideration of space is an important one, and the reduction in the rental cost that has to be charged against the bakery is a real saving.

Where the bakery has already been installed, and the question is one of substituting electricity, the question to be asked is, "Can you advantageously use the space thus saved?" As a matter of fact, the question of space is a very important one in the kitchens and bakeries, and very few hotel kitchens, where business is good, are not overcrowded and in need of more room.

For obvious reasons the hotel bakery should be located so as to secure adequate light and ventilation; but the use of electricity will much improve any situation that may be selected, and can be adopted in places where the use of fuel would not be possible.

The next point, after the saving of space and the possible use of space not otherwise available, is the economy of labour. Here the question of the best oven enters, for there is a wide variation among electric ovens, and the great progress in electric baking in the past few years has effected economies and advantages in their use that make the present-day oven far better than those of even a few years ago.

Economical Advantages.

Some of the economical advantages resulting from the use of electric ovens may then be pointed out. When the extreme heat of a modern electric oven is turned on, the temperature necessary for quick and efficient baking is attained in a comparatively small space of time. The long period of preliminary heating necessary in coal and gas ovens is avoided. This is more than a simple saving in fuel; it is a big saving in labour as well. The wages of the fireman may be small, but they go on in good times and bad, and add to the cost of operating coal ovens. The time spent by the pastry *chef* in watching his oven heat to the proper degree has a calculable effect on the amount of work he can turn out. This is an appreciable factor, too, after the baking has started, for the uniform regular heating of an electric oven requires less of the time of the pastry *chef*.

Economy of Operation.

As an illustration of what can be produced in actual operation under working conditions, the pastry *chef* of the Quaker Cafetria, Sacramento, Cal., with an electric oven consuming 10·5 kw., produces per week 500 pies, 63 large cakes, 105 pans of hot bread, 15 pans of shortcake, 45 loaves of nut bread, 250 cups custard, 600 baked apples, 250 apple dumplings, and 35 puddings. Another and smaller bake oven for meats, consuming 6·5 kw., turns out each week 280 lb. rib roast, 60 lb. lamb, 40 lb. pork, 210 lb. stew, 100 lb. hash, 50 lb. bacon, 30 lb. ham, 50 lb. of "made" steak, 15 lb. meat loaf, 90 lb. turkey, 75 lb. chicken, 50 lb. duck, 450 lb. fish, 800 lb. roast potatoes, 100 lb. beans, 100 lb. macaroni. Great quantities are possible with electricity, where practically no time is lost and the maximum baking heat is steadily maintained.

Comparing the space occupied by an electric oven and an ordinary brick oven, Mr. G. J. Bucker, who has devoted considerable study to the question, gave the following example:—A brick oven having a capacity of 240 1-lb. loaves of bread occupies a floor space of 10 ft. wide × 12 ft. deep, or an area of 120 sq. ft. An electric oven of the same capacity measures 4 ft. wide × 8 ft. deep, or an area of 32 sq. ft., which is about one-fourth the floor space occupied by the brick oven.

A still further consideration affecting the comparative cost of baking by coal and gas or electricity is to be found in the reduction of waste and loss. The heating elements of a modern type of electric oven are not confined to either the top or the bottom of the oven, but are uniformly distributed, so that every part of the oven is at the same temperature. There are no variations in different parts of the oven, or at different periods of the baking. The results are uniformly baked products. The oven bakes the same all day long, and day after day. Requiring less of the attention of the *chef*, it results in practically no spoiled baked goods.

These various advantages have been accentuated because they all bear directly on the cost of fuel, and that is so often the stumbling block in the minds of many hotel managers, who would otherwise install electric ovens. They see no further than the figures of their coal or gas bills, but when the reduced overhead cost is properly figured, the reduced labour bill calculated, the increased volume of pastry, and the lessened loss from poorly baked goods are taken into consideration, the nominal differences between the fuel bills are insignificant.

There are further advantages in electric baking, not so intimately connected with the cost problems, but still very matter-of-fact advantages, which indirectly mean money to the hotel. Take that same uniformity of baking of which we have spoken. Nothing is more helpful in keeping customers than the bread and pastry, and when the quality is always uniform in colour and texture, it binds the customer to the place.

The employés find better working conditions where electricity is used, as the temperature is less and the ventilation better, and their satisfaction will be reflected in the character and amount of work they turn out. Emphasis has been placed on the fact that the up-to-date electric oven has almost perfect insulation, and retains a high temperature for hours after the current has been switched off. As a matter of fact, pyrometer tests have been made which show that a baking heat is still retained for hours after the oven is disconnected. In order to utilise this heat to advantage, bread should be baked first at the highest temperature, and, after switching off the energy, lighter goods, such as cakes, pies, puddings, &c., can be baked, as they do not require so much heat. Here, again, is a saving which should be pointed out to the prospective customer, as with less efficiently insulated gas or coal ovens it would be necessary to use fuel throughout the whole of the baking.

Some Actual Figures.

To give a final example of the economy and advantage of electric cooking, we may take the figures of the New Vienna Bakery in Salt Lake City. This bakery has a thorough modern equipment, including individually motor-driven mixers, dividers, rounders and electrically-heated wrapping and sealing machines, and the company does an exclusive wholesale business, its entire product being sold through retail dealers. The scale of its work may be judged from the fact that it sells 18,000 loaves daily.

The main body of the oven measures 4 ft. high, 10 ft. wide, and 12 ft. deep; it rests on an angle-iron frame 27 in. high. It is divided into four chambers, each 56 in. × 34 in. × 16 in. high, which provide a baking surface of 208 sq. ft. The oven has a capacity of 836 12-oz. loaves or 456 25-oz. loaves of bread. The oven is divided in the centre by a partition, with two baking compartments on each side, one above the other. All compartments have 1¾-in. tile floors. The customary steam connection is provided for each. Each half of the oven has three heating elements—one in the top of the upper compartment, one in the top of the lower compartment, and one directly under the floor of the bottom compartment. With this arrangement, heat is provided for the top and bottom of each baking chamber. Each compartment has a mercury thermometer and inside lights.

The oven is wired for 220-volt, two-phase service. It takes a maximum of 75 KW., and averages 48 per cent. of this demand when baking 16 hours per day, and 55 per cent. on eight hours' baking per day. When making ¾-lb. loaves, it requires 45 minutes to load the oven, bake the bread, and take out the finished product. On this schedule, 25,000 ¾-lb. loaves could be baked in 24 hours' continuous baking.

To sum up, it may be said that the chief selling points to emphasise in connection with the installation of electric ovens for bakeries, either for bakers and confectioners or for big hotels and restaurants, are :—

Maintenance of a uniform temperature throughout the period of baking ; the entire absence of the dirt, dust, and smoke, which inevitably go with the old brick oven ; simplicity of operation ; ease of control ; perfect heat distribution ; better results in baking ; cleanliness and sanitation ; utilisation of all heat generated, and the great saving in floor space.

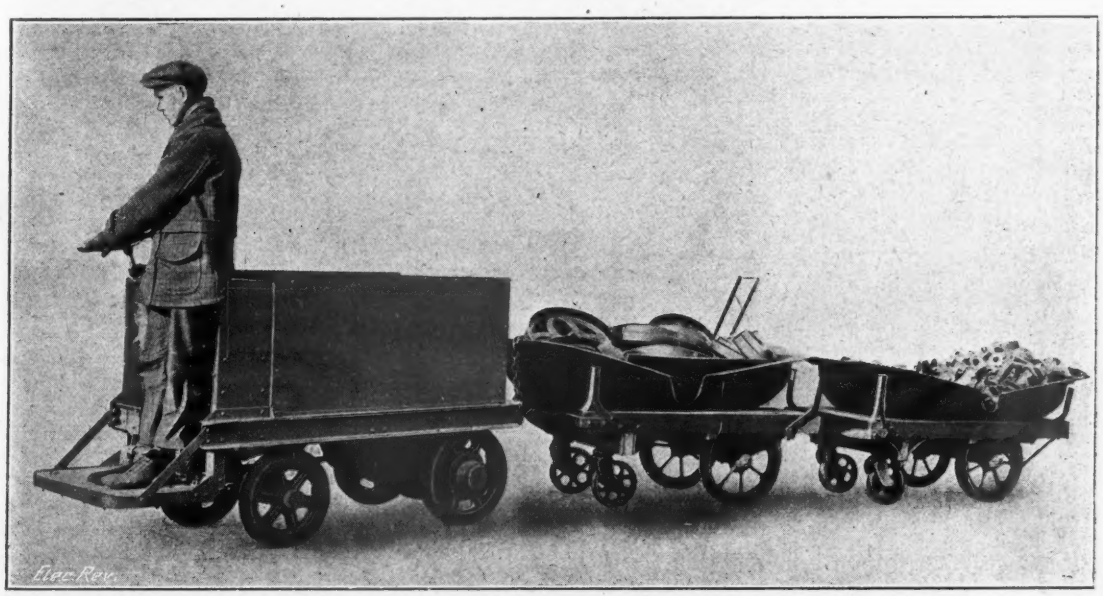
ELECTRIC TRUCKS AND TRACTORS.

AMONGST the many problems which have been forced into prominence in this country by the war, those which have reference to labour economy must occupy a leading position. In the past, small fortunes have been wasted on the assumption that manual labour was cheap because wages were low and such labour was plentiful. Now, with the scarcity of labour of all kinds, even the most conservative have perforce turned their attention to labour-saving appliances. One direction in which there is an enormous field for improvement in this country is in the internal handling of material in our warehouses, factories, and railway terminals.

Despite the adoption of transporters and cranes, the hand-truck and barrow still figures very largely as a local means of transport, although obviously out of date, inefficient, and wasteful. To meet the conditions of such work, the industrial electric battery truck has been introduced and very largely applied in America, while it is also significant that it is being tried, and giving satisfaction, in various situations in this country.

It must be obvious that there are numerous situations where satisfactory crane facilities are almost impossible, though a small power-driven industrial truck for short haulage would meet the case quite well. There are other situations in warehouses and railway stations where a small battery tractor is preferable and more economical, because it can be kept in operation all the time, if necessary,

LANSING INDUSTRIAL ELECTRIC TRACTOR WITH LOADED TRAILERS.



LANSING INDUSTRIAL TRACTOR HANDLING FOUNDRY PRODUCTS.

Water-power in France.—By a law enacted in September last, the French Government has given sanction to the State financial support of hydraulic works for the production of energy for sale, with, of course, a measure of control and a share in the profits. The importance of this question is due to the large importation of coal—18 million tons in 1912, of which half came from Great Britain. There is still three million H.P. at low water and eight millions, on the average, in French waterfalls which have have not been utilised.

hauling less expensive trailers which are loaded and unloaded in relays continuously.

The latest type of industrial battery truck and tractor to be placed on the British market is the "Lansing," which is being supplied by Messrs. Baxter & Caunter, Ltd., and is illustrated herewith. Like its predecessors, it is of American origin, and has, we believe, met with very considerable appreciation by the railway authorities on the other side.

THE LANSING INDUSTRIAL TRUCK.

In the Lansing truck the operator's platform and seat are so placed that he can either sit or stand, and in a quarter-turned position has a view both behind and in front of the truck. Although both lever and wheel steering can be supplied, the wheel steering is for the most part adopted, being preferred by the users. The steering is easy, due to suitable load distribution, and the short wheel base and small over-all dimensions enable turning to be done in a small space.

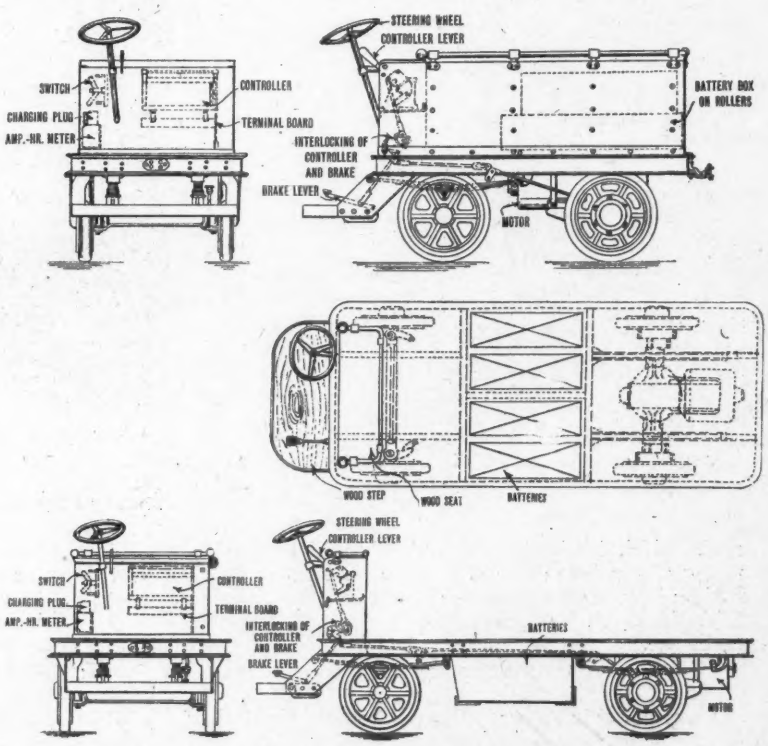
The controller is under the driver's seat, with an operating handle, having an up-and-down movement under the steering wheel, on the driver's right.

The controller is of the Westinghouse series-parallel type, giving four speeds each way; each step is indicated by the quick action of a ratchet wheel and pawl, and it is provided with a special interlock with the brakes, such that the brakes can only be set when the controller is in the neutral position. The controller is locked when the brakes are set, although with the controller in the neutral position the brakes may be released and operated freely in coasting. The controller may be thrown to neutral position either by the controller lever or by the pedal which simultaneously sets the brakes. This arrangement eliminates intermediate switch or circuit-breaker, ensures that the motor will not run with the brakes on, or that the machine will not start with the brakes off until the controller handle is moved, and provides an effective emergency stop. The motor, of standard Westinghouse vehicle pattern, has certain details specially adapted to the Lansing drive-axle, which consists of a steel casting enclosing a 10 to 1 worm drive, differential, and bearings in an oil chamber, attached direct to the motor. The gear is of bronze alloy, with a case-hardened steel worm, the shank of which is attached to the motor shaft, and is carried at the motor end in an annular ball bearing and at the opposite end in a double-thrust bearing. The differential is of the bevel gear type with six high-carbon or nickel-steel gears. Timken roller bearings for wheel hubs, and solid rubber tires on wheels, are fitted. The trucks and tractors are usually fitted with 24-cell Ironclad-Exide batteries, although other types are available if specified; a double-throw charging switch and standard plug, together with a Sangamo ampere-hour meter, form part of the equipment.

The frame is built of standard rolled sections, the driver's platform being a fixture; the driver operates the brakes by means of a foot pedal, and a latch holds them set; the brakes are external acting steel bands, lined with raybestos.

The trucks, being self-contained load carriers, have the battery fitted under the frame or chassis, while in the case of the tractor the battery is carried inside a compartment forming the body of the vehicle.

The Lansing trucks are built in several sizes; models H and G, with a rated capacity of 5,000 lb., are 9 ft. 4 in. over-all in length, and have a turning radius of 5 ft. 6 in. and 6 ft. 6 in. respectively. The tractors, which are very popular in the States, have in models C and D, rated trailer load capacities of 4,000-5,000 lb. and 10,000-12,000 lb.; over-all lengths of 6 ft. 8 in. and 7 ft. 9 in.; wheel bases of 2 ft. 9 in. and 3 ft. 6 in.; and wheel treads of 27 in. and 30 in. respectively, while the overall height is 4 ft.



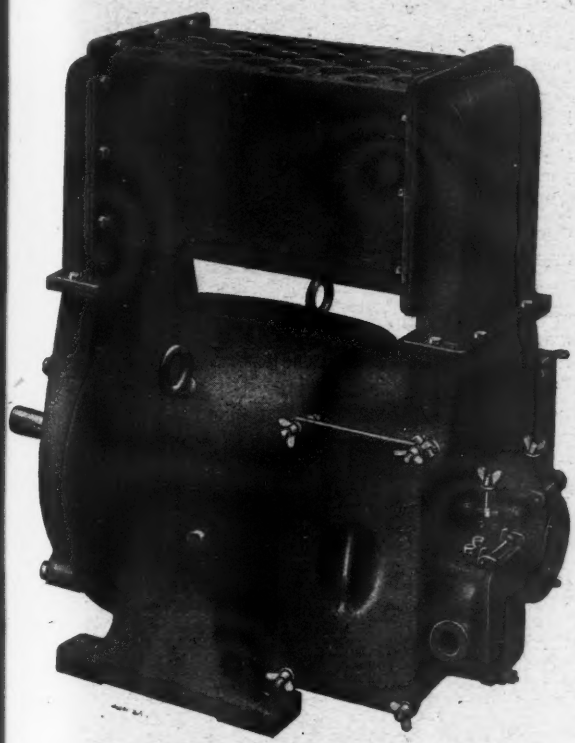
VIEWS SHOWING CONSTRUCTIONAL DETAILS OF LANSING TRACTOR AND TRUCK.

Accident at Nottingham.—Last week a car, descending the Derby Road tramway route, got out of control and ran into a stationary car, upsetting the latter, two persons being killed and several others injured as a result.

THE LO-THERMO MOTOR.

MESSRS. ELECTROMOTORS, LTD., of Openshaw, Manchester, send us particulars of a new development in the design of totally-enclosed motors which marks a further step in the advancement of practical electrical science, and for which, we understand, patents are pending.

The demand for totally-enclosed motors has, in the past, been restricted by the difficulty in constructing them, particularly as



LO-THERMO MOTOR, WITH TUBULAR RADIATOR.

regards machines of large size, and they have been extremely costly in comparison with ventilated motors.

The reason for this is that all the heat generated in an enclosed motor must of necessity be radiated through the outside carcass of the machine, and as the rate of dissipation is limited, it follows that the heat generated must also be limited, and, from a practical point of view, this necessitates that the output for a given carcass is restricted, with the result that these machines are relatively costly. Furthermore, high speeds have been impracticable, for the very reason that a large proportion of this heat is generated by the armature-iron losses alone, and as these increase with the speed, a point is soon reached when these losses alone balance the radiating capacity.

Many expedients have been employed to overcome this, such as pipe-ventilated motors, forced ventilation, &c., but the necessary trunking is always an objection, and frequently impossible. Other devices, such as pipes through the machine itself, have been employed, and fins and ribs upon the carcass, but still without much success.

A more successful means has been the employment of a hollow bedplate upon which the motor is mounted, and through which air is circulated from the motor. The hollow bedplate is embedded in concrete to absorb the heat, or can be cooled by a system of water-pipes. This introduces an element which has to be taken into account in any scheme of erection, and any arrangement which eliminates this fixture is an obvious advantage.

The idea of the present invention lies in a practical means of providing large air-cooling surfaces constructed in such a manner that the system can be applied to standard machines of the well-known chimney or pipe-ventilated type, the construction being such that the surface can easily be adjusted by the manufacturer to suit any requirement.

It is constructed in various forms, illustrations of two of which are given herewith. In the first of these the radiator proper consists of a box with end pieces designed to fit on vertical trunk openings in the motor end covers, and through this box pass in a vertical direction a number of thin metal tubes. Inside the back bearing of the motor a fan is fitted on the armature-shaft, which causes a circulation of air through the machine and through the radiating box, and the arrangement of the tubes, &c., is such that the air impinges on the thin vertical tubes, giving maximum cooling. The advantage of the system is that not only is increased radiating surface provided, but as the tubes are thin compared with the motor carcass, the radiation is much greater, and it is possible to approach within quite reasonable limits of the capacity of a ventilated motor of given frame size without the use of anything excessive in the size of the radiator.

Another form of the invention is also shown, in which the tube radiator is replaced by one having thin sinuous metal sides with top and bottom covers, and also having baffle plates mounted inside the radiator, which cause the air to impinge in a thin stream against the outside surfaces, so that this type performs the same functions as the tube radiator.

The design lends itself admirably to an entirely water or dust-tight construction, widening its field of use enormously, yet, at the same time, the bulk is of quite moderate dimensions—in fact, less than for an ordinary totally enclosed motor when dealing with the larger powers.

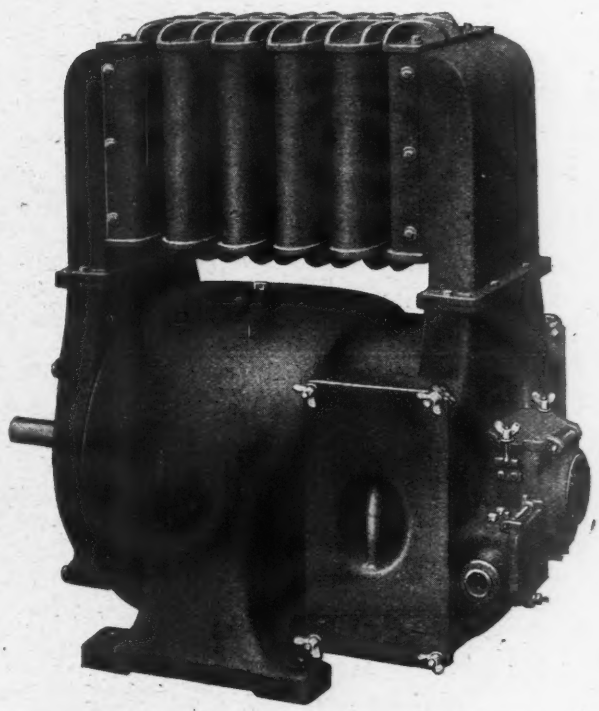
This development will have exceptional opportunities in ammunition factories, chemical works, collieries, foundries, flour mills, bleach works, steel works, wood-working plants, breweries, for outdoor use, and, in fact, anywhere where it is necessary for motors to work in either an explosive, dust-laden, or wet atmosphere.

To centrifugal pump makers it offers exceptional advantage for the reason that high speeds are available, which not only means cheaper motors but enables smaller pumps to be used for a given duty, thus materially reducing the total cost of such combinations.

A considerable number of these motors have already been built and put into practical service in collieries, chemical works, &c., with the most satisfactory results.

IMPROPER USE OF AUTO-TRANSFORMERS.

THE principal cause of the favour with which auto-transformers have been regarded during recent years is their moderate first cost. From the technical point of view, however, they must be used with caution, and the following example (from *L'Industrie Electrique*) is an excellent illustration of the grave risks resulting from unsuitable application of this type of apparatus. A supply company contracted to supply a distributing company with 3-phase bulk supply at 22,000 volts, 50 cycles per second, but had available for the purpose only a 16,000-volt, 50-cycle distribution, and a 25-cycle supply. A frequency-converter was installed giving 2,300-volt, 50-cycle supply, and the problem then was to establish a transformer equipment capable of converting the 2,300-volt and 16,000-volt supplies to 22,000 volts. The arrangement adopted is shown in fig. 1 (page 8), and consists of a delta-connected primary winding for 2,300 volts and a star-connected secondary for 22,000 volts, the secondary playing



LO-THERMO MOTOR, WITH BAFFLE-TYPE RADIATOR.

also the part of a 3-phase auto-transformer, raising the 16,000-volt supply to 22,000 volts.

The neutral of the existing systems of distribution being insulated, the same arrangement was retained for the secondary of the new transformer in order to avoid the addition of current transformers and the substitution of 3-pole for the existing bipolar gear on the oil circuit-breakers.

The first trouble experienced on the system was under the following conditions:—Having opened the 2,300-volt primary delta, it was proposed to supply 22,000-volt current from the

D

16,000-volt supply alone, using the star-secondary as auto-transformer. Immediately severe telephonic disturbances were set up, several lines being unusable, and in order to get over the trouble, the primary delta winding was kept closed. Some time afterwards an accidental earth on the distributor's network revealed another defect of the transformer equipment. The pressure on the supply company's system rose from 16,000 to 19,000 volts, a high-frequency current (caused by the arc to earth) flowed through the auto-transformer, and a violent discharge destroyed the lightning arresters.

After this experience, a supplementary transformer was installed to effect the 16,000-volt/22,000-volt transformation. Had a double-wound secondary been used in the first place, instead of the auto-transformer, the cost would not have been much higher, and disturbances would have been eliminated.

From this example it may seem that the neutral point of

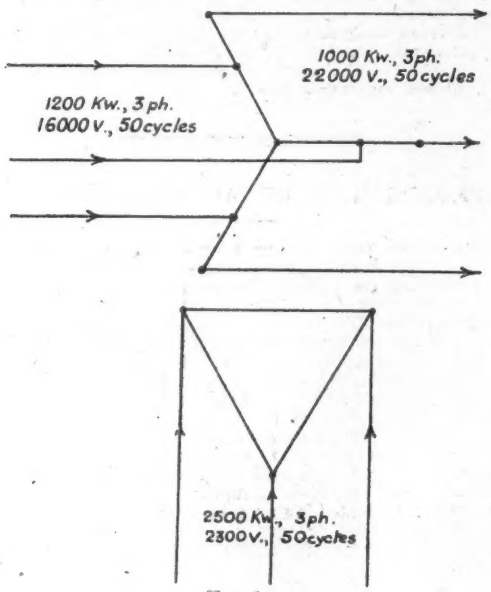


Fig. 1.

all auto-transformers should be earthed. It should be remembered, however, that: (1) Earthing an existing insulated distribution system requires the substitution of 3-pole for 2-pole relays on automatic circuit breakers. (2) The presence of several earths on a distributing system favours the development of harmonic currents, which may produce serious telephonic disturbances, and even attain values high enough to cause material damage. (3) It is not advisable, in any case, to connect two important systems of distribution by auto-transformers, since all disturbances, of whatever origin (atmospheric disturbances, earth faults, &c.), are then transferred freely from one system to the other. The magnetic circuit of a double-wound transformer forms an elastic link, eliminating these risks.

EXCESS PROFITS TAX APPEAL.

[Decision in favour of electric supply companies.]

On Friday, December 15th, the appeal case of the Electricity Supply Companies of Great Britain was heard by the Board of Referees. The Provincial Companies and certain of the London Companies (127 undertakings in all) were represented by Mr. H. B. Renwick (managing director of the County of London Electric Supply Co.), and certain other of the London companies (10 in number) by Mr. W. F. Fladgate (director of the Charing Cross Electricity Supply Co.). The appeal thus represented no less than 137 companies' undertakings, involving a capital expenditure of about £25,000,000. The application of the companies was for an increase of the statutory percentage.

The Referees decided that in the case of the London-suburban and provincial companies the statutory percentage should be increased from 6 per cent. to 7½ per cent., and in the case of the London companies (other than the above) the percentage should be raised from 6 to 7 per cent.

The following companies are classed as London-suburban companies:—The County of London Electric Supply Co., the South London Electric Supply Corporation, the South Metropolitan Electric Light & Power Co., and the Metropolitan Electric Supply Co.

The following are the chief considerations which weighed with the Referees in arriving at their decision:—

The electricity companies are working under a concession, viz., a terminable lease. Not only is the lease terminable, however, but the terms of the compulsory purchase provided therein are extremely uncertain, and provide nothing for goodwill. The companies are also working in competition and subject to statutory limitations, obligations, and restrictions, which, due to these and other causes, prevented in the past the forming of adequate reserves for depreciation.

Further, the supply of electricity is an industry newly developed, and the present companies were the pioneers. The industry necessitated a capital expenditure heavier in the first place than in ordinary commercial business, and there is also involved a capital expenditure continuously throughout the whole of its lease in advance of the profitable demand. The pioneer work in developing the industry involved the successive scrapping of plant (which rapidly becomes obsolete owing to new inventions), thus hitherto preventing the providing of adequate reserves. The proper working profits were, therefore, deferred. Moreover, the companies were all originally established as lighting companies in conformity with the Electric Lighting Acts, in which no mention of power for driving machinery is mentioned, and which were framed to deal with lighting only. The supply of electric power was a later development, depending on the invention and perfecting of the electric motor, which has, in fact, become thoroughly efficient only during the last decade or so. The companies, therefore, had to adapt their systems to cope with this now big and growing demand; and in many cases this meant the partial or complete reconstruction of their distributing systems, and the scrapping of a large proportion of their generating plant and, in any case, much larger expenditure of capital in advance of demand.

It was shown very strikingly what a large proportion of the output of many of the electric lighting companies is for power purposes, and, although working under a terminable concession, they are, in effect, practically power companies without enjoying the advantage of perpetual tenure, as in the case of companies working under a Power Act.

Evidence on the above lines was given by Mr. H. B. Renwick, Mr. C. H. Merz, and Sir Harmood Banner.

The thanks of the industry are due to Mr. H. B. Renwick for initiating and organising the appeal, and for establishing, apart from the financial side, the principle that electric supply companies working under statutory obligations, and subject to compulsory purchase, are entitled to special consideration as compared with ordinary traders.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

National Industrial Organisation.

The article published in your issue of the 22nd goes to the root of the matter, and I trust Mr. Looker's outspoken views will be generally endorsed.

Hitherto the public has been apt to view with suspicion any tendency on the part of competing manufacturers to co-operate with each other for any purpose whatever. It has been too readily assumed that a trade association could have but one function, and that a sinister one, viz., to squeeze higher prices out of the consumers of their goods.

Your contributor now shows that the interests of the consumers themselves, and, in fact, those of the entire community, are inseparably bound up with those of the producers.

It is particularly instructive to note that the duty of fostering scientific and industrial research in this country is placed on our *manufacturers*, who are recommended by the Government to work together in these matters through the medium either of their existing trade associations or of new trade associations formed for that specific purpose.

Surely the time is ripe for all our manufacturers to recognise that they cannot hope to survive in the approaching international struggle for the world's trade unless they sink their independence sufficiently to permit of their co-operating with their trade competitors for such purposes as "raising the average standard of production" and increasing the efficiency of their operations by the utilisation of whatever improved materials and processes their co-operative research may reveal.

The need for effective industrial organisation was never more urgent, and I hope the Electrical Review will continue to exert its influence along the lines it now advocates.

Harry Allcock.

Hale, Cheshire, *December 28th*, 1916.

City and Guilds Examinations.

It should be the duty of every principal, head of department, and teacher at our technical institutions to "read, mark, learn, &c.," the annual report relating to the above, recently published; but we wonder how many will do so.

On more than one occasion you have allowed us to comment on the bad treatment which "Electric Wiremen's Work" (now renamed "Electrical Installation Work") re-

ceives at the hands of those in authority at technical institutes. Now this is the fundamental electrical engineering subject; it appeals to all sorts of people besides wiremen, and should, therefore, be taught at more centres than the other electrical subjects, and have a preponderance of students.

From the report we gather the following facts:—

(*a*) That in session 1915-16, "Electric Wiremen's Work" was taught at only 48 centres, as against 108 centres for "Electrical Engineering," a ratio of 44½ per cent. In 1914-15 the ratio was 48¾ per cent.

These figures clearly show that the fundamental subject ("Electrical Installation Work"—to give it its new name) is grossly neglected. In a word, our technical institutes give twice as much attention to the training of officers as to the training of men for the electrical army; even though the cost of equipment in the latter case is far less. We might also infer that when there is any cutting-down to be done, it is the fundamental subject which suffers.

(*b*) The percentages of those "in attendance" at the classes who got as far as sitting for examination were as follows:—

	1916.	1915.
Electric wiremen's work ...	15 per cent.	23 per cent.
Electrical engineering ...	28 per cent.	31½ per cent.

Thus, on the average, we have 70 per cent. of the electrical engineering students failing to come up to the examination scratch, and no less than 80 per cent. of the "wiring" students failing likewise. The construction we put on the 70 per cent. is that, in spite of the attraction of well-equipped laboratories, the subject is too far over the heads of the majority. In the case of the 80 per cent., we should say the result was due to inadequate equipment and tuition simply.

(*c*) The percentages of those who passed to those who sat at the two sets of examinations are as follows:—

	1916.	1915.
Electric wiremen's work ...	51 per cent.	50 per cent.
Electrical engineering ...	37 per cent.	46½ per cent.

These figures show that in spite of the miserable equipment and poorly-paid teaching vouchsafed to the so-called "Wiring Classes," the examinational results therein are decidedly better than those of the other classes. It is, then, surely worth while giving more attention to these classes. May we not infer, also, from the above figures that many students who are at present pitchforked direct into the electrical engineering course would do better if they had a preliminary grounding in "Electrical Installation Work"?

Very few people, we suppose, are aware that students in a Grade II or Final Class, who find the examination paper beyond them, can take the Grade I paper and obtain the same certificate that they got when in the lower class!

This sort of thing reflects strongly on the quality of the tuition, and depreciates the value of the tabulated results in the official report.

The excellent work being done by Mr. G. Bowron in the electrical workshops at Queen Mary's Convalescent Auxiliary Hospital at Roehampton, London, has attracted much favourable attention, and has been regarded as a novelty; yet it is exactly the sort of work that should have been the regular thing in "Wiring Classes" for years past.

A. P. Lundberg & Sons.

London, N., *December 27th*, 1916.

[We admire our correspondents' enthusiasm on behalf of electrical installation work, though we do not share the view that this is "the fundamental electrical engineering subject." Surely this is an extreme view to take; the manufacture of electrical goods and apparatus is of vastly greater importance in respect of both internal and export trade than the installation of such apparatus, which absorbs only a very small percentage of the cost of construction. Adapting our correspondents' military metaphor, we think they have mistaken the Army Service Corps for the Army itself. We fail to see, too, why the failures of candidates in one case are attributed to quite different causes from the failures in the other; is there not here a suspicion of prejudice? We quite agree as to the excellent work done by Mr. G. Bowron, which we described and illustrated in our issue of October 13th last.—EDS. ELEC. REV.]

WAR ITEMS.

Exports to China.—The "London Gazette" for January 2nd contains a further list of persons to whom exports to China and Siam may be consigned.

Ministry of Munitions and Copper.—The Ministry of Munitions announces that from January 1st no copper will be supplied for the purpose of casting brass or other copper alloy, and no brass or other copper alloy may be cast except for the purposes of Class "A" or Class "B" orders, under the Ministry of Munitions Circular L. 33. A further and lengthy notice respecting the Ministry and copper appears on a later page of this issue.

Controlled Works.—The number of establishments controlled by the Ministry of Munitions is now 4,623.

The Armorduct Co. to be Wound Up.—In the latest list of businesses ordered to be wound up is the following:—

Armorduct Manufacturing Co., Ltd., 6, Farringdon Avenue, London, E.C., electric cable and conduit manufacturers. Controller: John Paterson, 1, Wallbrook, E.C. January 1st, 1917.

Lighting Restrictions: The Lighting of Tramcars.—At Rochdale, on Friday, William Clough, the manager of the Bury Corporation Tramways, was summoned for permitting a lighted external electric lamp to be used on a tramcar belonging to the Bury Corporation on December 17th, at 7.35 p.m. Evidence showed that under the canopy at the front of the car there was an unshaded light. Defendant said it was a 16-C.P. light, and without it passengers using the stairs would be in danger of falling. The lighting of the car was satisfactory to the Bury, Bolton, and County Police, and in Leicester, Sheffield, and Birmingham there had been some relaxation of the lighting order after the attention of the Home Office and Board of Trade had been called to the number of accidents taking place owing to lack of light on the tramcars. The Magistrates' Clerk said it seemed rather absurd that a car should be lighted like that in Bolton, while at Rochdale it must be in darkness. There should be some uniformity about the lighting. The Chief Constable said the Order stated that no light must be visible from outside. Mr. Clough: Consistently with public safety. The Magistrates imposed a fine of 20*s*.

Exemption Applications.—At the Sheffield Tribunal, in respect of the application of a firm for an electric crane driver, aged 29, married (three children), and passed for general service, the Military Representative pointed out that C 2 and C 3 men could do the work, and that in some instances in Nottingham women were driving cranes. Adjourned to enable the firm to see about badging.

At the Stockton Borough Military Tribunal, Mr. A. E. Forbes, on behalf of the Imperial Tramways Co., Ltd., stated that they had released 421 men for the Army. His application on behalf of two motormen, single, aged 40 and 32 respectively, classed B 3, for conditional exemption was granted.

At Burnley, Mr. H. Mozley, tramway manager, appealed for his cashier and general clerk, aged 30. Out of 17 clerks, 11 had joined the Army, and four had left for other occupations. Training for the position took years. He had 17 clerks, but all were temporary. The case was put back to the end of February.

At Bolton, an electrical engineer appealed for an engineer and wireman, 27, and single. He said the man was the very last he had left. He had let all the others go, and now they wanted the last one. If he had kept the others until they had to go he would probably have been told he could keep so many. Exemption was granted to February 28th, with right of appeal, though it was intimated that the decision would probably be appealed against.

Before the Sevenoaks Rural Tribunal, the Sevenoaks Electricity Co. appealed for Messrs. J. T. Vounsden (32), manager; J. H. Wickenden (27), cable jointer; P. H. Topping (27), engineer; and J. Shaw (29), mechanic. The managing director (Mr. F. R. Reeves) said that the staff had been reduced to a minimum, and to take more men away would cause a stoppage. The applications were made with great reluctance, as the company were quite aware of the country's needs, but they had their obligations. He had been in communication with the Board of Trade, and was informed that workmen would not be taken away unless the company could spare them, electricity, like gas and water, being necessary for the use of the public. Amongst those who had joined up from the staff were the chief engineer and his chief assistant. There were nearly 200 consumers of current in Sevenoaks, and the Government also had a supply. The manager was given conditional exemption, and the others until March 31st.

At Berwick-on-Tweed, the Electric Light Co. appealed for their accountant, Mr. R. Hamilton (34). The manager said they were doing with the minimum number of employés, and women were of no use. They were supplying motive power to several important local factories. Conditional exemption was conceded.

At Sevenoaks, conditional exemption has been granted to Mr. F. G. Humphrey, electrical engineer, from whose works over 30 men have joined up.

At Oxford, Mr. S. A. Stock (24), manager of the electrical engineering business of Mrs. E. Storey, defended an appeal by the Military against six months' exemption. The Military Representative said that respondent was passed for general service, and nine months had been allowed to fill his place. Mrs. Storey stated that Mr. Stock was the only man she had to carry on her late husband's business. She had done her best to get another man, and was quite willing to allow Mr. Stock to go if she could get a substitute who was a qualified man. The business could not be carried on without someone who could do the buying, installing, estimating, &c., and she had no income except that from the business. Captain Bailey intimated that it was possible that the Substitution Officer could get a substitute, and the appeal was respited for a month for this to be done.

At Faringdon, Mrs. Butler, of Carswell Manor, asked for conditional exemption for H. R. Jacobs (36), who has charge of the electric light plant, but exemption was refused.

At a sitting of the Surrey Appeal Court, the Military Representative appealed against conditional exemption

granted at Godalming to E. Lown (29), electrician to Messrs. Read & Co., of Farncombe, on the ground that he was doing work of national importance. The exemption was revised to three months.

At Barnsley, the Electric Traction Co. appealed for a car-shed foreman (3), a brakesman (39), the parcels superintendent (36), two traffic inspectors (24 and 35), and a tram driver (26). The car-shed foreman, the parcels superintendent, and the eldest traffic inspector were conditionally exempted, and the other appeals were rejected.

At Oxford, the Electric Co., Ltd., appealed for temporary exemption to January 31st for L. J. Hodge (31), electrician, who has been with the company for seven years, and is regarded as indispensable. Hodge, it was stated, did important work, connecting all the cable from the streets to the houses and the power stations. It was dangerous work, to the man, to the buildings, and to the valuable plant at the generating station. A substitute had been obtained and was being trained, but it was impossible to think that he would become efficient in a month. It was intimated that Hodge had been anxious to volunteer for service, and had only been kept back by pressure. The Tribunal allowed until January 31st.

At Chesterfield, a final month has been allowed to a fireman engaged at the refuse destructor works for the T.C. A similar term was previously granted for a substitute to be obtained.

At Barnsley, an appeal was made by Mrs. Burns for the retention of B. Gregory (22), electrician, passed in Class A. Two months were allowed for a substitute to be found.

At Whitby, the Military Representative asked for a review of a certificate of exemption held by H. Frith, electrician with Mr. A. H. Walker, but no alteration was made. The Military Representative said that he should appeal against this decision.

A Brighton firm of electrical engineers, engaged on much hospital work, appealed for a wireman and electrician. The firm stated that it was impossible to replace the man, as those available found they could now start on their own account. Two months were granted.

At Bexhill-on-Sea, Messrs. J. L. French & Co. asked for further time for H. Mullinger (40), manager of the electrical and heating department of the business, and who is continuing on special Government work. Another three months, with the Volunteer condition, were granted.

The West Kent Appeal Court, on December 19th, had before them again the case of Mr. A. Leach, electrical engineer, of Maidstone, referred to in a recent issue of the ELECTRICAL REVIEW. Mr. Leach claims having applied for naturalisation in America, and for a passport for that country, and, as the matter is being considered by the Home Office, the case was further adjourned to await the decision.

At Coventry, the Corporation tramway department asked for exemption for five single and 72 married men, owing to the difficulty of obtaining suitable substitutes. The pre-war staff numbered 314, and that number is reduced to 147. It was stated that out of 27 substitutes, 12 had been retained. It was suggested that tramway workers, passed in low categories, who are already in the Army, should be released to replace men now working on the trams, and the Tribunal decided to place all the men claimed on the substitution list.

At Sheffield, Messrs. T. B. & W. Cockayne appealed for the retention of W. Fuller (35), electrical engineer, and exemption to June 30th was conceded.

Messrs. Page & Bloomer appealed, at Stourbridge, for T. White (31), electrician, and three months were allowed.

Worcester Tribunal has granted conditional exemption to F. J. B. Cook (36), the only man left in the electrical department of Messrs. J. Ward, Ltd.

At Weston-super-Mare, the Electric Supply Co., Ltd., appealed for H. Brewer (38), wireman, engaged in installation work. The manager, Mr. G. Charlton, said that if Brewer were taken the installation department could not carry on work. One wireman of higher classification was under orders to serve, and that would leave only two, including Brewer. The Military Representative recommended that the case be adjourned *sine die*, based on the medical category, C 3, and this course was adopted.

At Stockton-on-Tees, on December 28th, the Imperial Tramways Co. appealed for two motormen, aged respectively 40 and 32, and both passed in Class B 3. Mr. A. E. Forbes, for the company, said they had released 421 men for the Army. The Mayor said that the Tribunal were satisfied that the men appealed for would not be of a great deal of service to the Army, and they would be given conditional exemption.

At the Kingston-on-Thames Tribunal, the borough electrical engineer applied for exemption for a stoker, 26 and passed B 1. He said that owing to the scarcity of men he and his chief assistant had several times had to stoke the boilers. The Mayor, evidently willing to serve as a substitute, remarked that it was a "very healthy exercise for you; better even than golf. I would rather shovel coal than knock a golf ball about." Final exemption until Jan. 31st was granted.

Holidays.—The works of MESSRS. BRUCE PEEBLES AND CO., LTD., at Edinburgh, reopen to-day, after having been closed from Saturday last for the New Year holidays.

BUSINESS NOTES.

Calendars and Diaries.—The VICTA ELECTRICAL CO., LTD., 60, Queen's Road, Battersea, S.W., have issued a plain wall calendar with monthly slips.

From the BRITISH ALUMINIUM CO., LTD., of 109, Queen Victoria Street, London, E.C., we have received a wall calendar with neat monthly date slips at top right-hand corner above an interesting view of the company's Dam at Kinlochleven. On the back of the card is a complete roll of honour of the staff and employés of the company who are, or have been, with the Forces.

MESSRS. POPE'S ELECTRIC LAMP CO., of Hythe Road, Willesden, have issued a calendar with daily slips for 1917. The block is practically surrounded by cartoons of the Elasta funny man and the performances of the Pope Elasta British-made wire lamps.

From MESSRS. HASLAM & STRETTON, LTD., of Cardiff and Bristol, we have received a wall calendar, with monthly date slips, which will, by means of the picture in colour, "Annabel," brighten our New Year.

We are once more indebted to the ELECTRIC CONSTRUCTION CO., LTD., for one of their very useful pocket diaries. It is a simple and handy vest-pocket engagement book that cannot easily be done without, especially after one has become as used to it as we have.

MESSRS. W. H. WILCOX & CO., LTD., of Southwark Street, S.E., have sent us one of their 1917 Date Remembrancers—a wall calendar with monthly sheets.

MESSRS. TOY & WINSLOW, of Larkhall Rise, Clapham, S.W., have issued a wall calendar for 1917, small monthly date-slips appearing below a study in colour of "Aida." A series of desk-blotter slips has also been received.

THE ELECTRIC AND ENGINEERING SPECIALITIES CO., of 79, Great George Street, Liverpool, have issued a wall calendar with monthly slips for 1917. The feature is a woman-worker, executed in colour, who has set down her pails the while she enters into a neighbourly gossip, in which, presumably, she makes a forecast of coming events—"You mark my words!"

The *Chemical Trade Journal* has published a wall calendar, as usual, with large monthly sheets.

To the LANGDON-DAVIES MOTOR CO. we are again indebted for a pocket memoranda book, the opening pages of which contain a number of useful tables and particulars of the firm's standard sizes and types of motors. An insurance coupon is included.

Our Trade with New Zealand.—The *Board of Trade Journal* contains extracts from a supplementary report by Mr. R. W. Dalton, H.M. Trade Commissioner in New Zealand, in which, while recognising the difficulties under which home manufacturers are at present working, he lays emphasis upon the desirability of such manufacturers appointing agents in New Zealand at once, and warns them against deferring until more normal times the first steps towards the preparation of a selling organisation. Mr. Dalton says that the most important class in which the trade of the United Kingdom is deficient is machinery. In normal times our share of this trade should be larger than it has been. He finds that there is lacking a sufficiently close touch with the special needs of the market in specialised lines different from those in use at home, and an active selling campaign.

Mr. Dalton reports that an agent, whose head office is in Australia, but who travels through the whole of New Zealand once a year, desires to take up the representation in the Dominion of British manufacturers of electric lighting glassware, dry batteries, electric bells and indicators, ceiling roses and fuses, insulators, conduit tubes and fittings, porcelain counterweights, electric fans, lampholders, pocket flash-lamps and lighting switches. Particulars can be obtained at the Board of Trade Department of Commercial Intelligence in London.

An Ediswan Supper.—The staff of the West of England and South Wales Branches of the "Ediswan" Co., at the invitation of the district manager (Mr. F. W. Fifield), partook of supper at "Maxwell's" Restaurant, Bristol, on Tuesday evening, December 19th. Mr. Fifield proposed "The Ediswan Co." and "Bristol and Cardiff Staff," and referred to the continued progress of the company. He expressed the hope that on the occasion of their next happy party the war would be over. The enjoyment of the gathering was added to by the presence of Sergeant Ronald David, who at the time was in Bristol recuperating from wounds sustained in the Somme fight. Sergeant David, who joined the 6th Gloucesters at the outbreak of war, was the manager's chief assistant at Bristol, being transferred from the Cardiff office when the local depôt opened. The members of the staff contributed to the musical programme.

Works Extensions at Preston.—At the last meeting of the Preston Town Council, reference was made to a lease having been obtained by MESSRS. DICK, KERR & CO., LTD., of a plot of land at the Dock suitable for the erection of new buildings.

Palestine.—We have received from Mr. S. Feingold, of 3, Boulevard de Ramleh, Alexandria, Egypt, some literature respecting Teutonic efforts for trade domination in Palestine before the war, together with particulars of the Anglo-Palestine Commercial Intelligence Agency which he has formed for the purpose of awakening an interest in Great Britain and her dependencies in the prospects of doing business with Palestine after the war. He is anxious to get into touch with British manufacturers issuing export trade catalogues.

For Sale.—The Swansea Harbour Trust is offering for sale some electric motors, &c. Particulars will be found in our advertisements.

Catalogues and Lists.—From MESSRS. NOYES BROS. (MELBOURNE) PTY., LTD., we have received a fully illustrated brochure, showing electrical installations carried out by them in Australasia.

MESSRS. A. J. GREENLY & Co., of 37 and 38, Strand, W.C., have published a list of advertisement designs, with a view to giving a more or less definite idea of the cost of various forms of advertising work.

DEARBORN CHEMICAL Co., Chicago.—32-page illustrated pamphlet respecting corrosion, incrustation, and foaming in boilers, their causes, and the prevention of same by the use of proper reagents in the water.

MESSRS. CRAVENS' PATENT, LTD., 97 and 99, Corporation Street, Manchester.—24-page price list (illustrated) of many kinds of factory and warehouse trucks, ladders, trolleys, baskets, &c.

INTERNATIONAL TIME-RECORDING Co., LTD., 57, City Road, London, E.C.—16-page illustrated pamphlet describing their various time recorders.

MR. O. N. BECK, 11, Queen Victoria Street, London, E.C.—16-page pamphlet describing the bar and pipe-bending tools of the Wallace Supplies Manufacturing Co., of Chicago, for whom he is sole agent here.

THE ARORA Co., Loughborough, Leicestershire.—New list in a condensed form, arranged for over-printing on the front page, and covering all the goods put on the market to date—electric fires, boiling plate, rapid grill, and hearth stand—all of which can be supplied from stock with no advance in prices.

Bankruptcy Proceedings.—C. B. OGILVIE, electrical engineer, 43, Dudley Road, Whalley Range.—Receiving order made December 22nd on a creditor's petition.

The U.S. Industrial Situation.—In the course of an editorial on "Present Business Conditions," the American *Electrical Review and Western Electrician* (December 9th) contains the following comments on the present and prospective situation:—"In the electrical industry there is no dearth of orders, and business is as active as could be desired. The great difficulty seems to be that manufacturers are unable to secure the necessary raw materials, and consequently cannot show an output sufficient to meet the demand. There is nothing in the present conditions to indicate an early change in the industrial situation. Employment is easy to secure, wages are advancing, the agricultural as well as the manufacturing districts are very prosperous, and the railroads have more business than they can handle. The situation is abnormal and in some respects unsatisfactory, but the volume of production and consumption is unprecedented, and will no doubt continue so until the termination of the European war. Gold is rapidly accumulating in the country and credits are expanding, with the resultant danger of a reversal in these conditions at the close of the war. A rapid contraction of credit invariably involves severe losses and a period of depression."

Hardening Steel.—The Westminster Electrical Testing Laboratory, of York Mansions, York Street, S.W., has sent us a circular, describing the results obtained with the Wild-Barfield process for hardening steel, which is particularly suitable for hardening screw gauges, as it causes no change of dimensions, and scale, while the steel offers remarkable resistance to wear.

Dissolutions and Liquidations.—HOME-MORTON, KER, AND GIBSON, consulting engineers and industrial works designers' Glasgow and London.—Messrs. D. H. Morton, A. Home-Morton, W. A. Ker & G. H. L. Gibson have dissolved partnership. The business will be continued, by all excepting Mr. Ker, as Home-Morton & Gibson. Mr. Ker will carry on business as W. Arthur Ker & Co., at 115, St. Vincent Street, Glasgow. Messrs. Home-Morton & Gibson will attend to debts.

H. TRAUN & SONS, 25, Goswell Road, London, E.C.—Creditors must send particulars of debts, &c., to the Controller, Mr. J. D. Pattullo, 65, London Wall, E.C., by February 10th.

ISARIA, LTD.—Creditors must send particulars of their claims, &c., to the Controller, Mr. G. S. Pitt, 140, Leadenhall Street, E.C., by January 28th.

Book Notices.—We have received copies of several journals published by Messrs. L. Vaudecrane et Cie., of the Rue Taibout, Paris. One is a recently started weekly paper, *L'Exportateur Francais*, and another is *Le Bureau Moderne*, which has reached its fifth year. Both of them are business-like publications, which should be of interest to those who are concerned, or wish to be, with French home and colonial industrial and commercial affairs.

"Some Modern Methods of Ventilation." By R. Grierson. London: Constable & Co., Ltd. Price 8s. 6d. net.

"Engineering Directory." No. 63, October, 1916. London: Engineering, Ltd.

"Practical Safety Methods and Devices—Manufacturing and Engineering." By G. A. Cowee. London: Geo. Routledge & Sons, Ltd. Price 12s. 6d. net.

Our old friend *Hazell's Annual*, in the thirty-second year of its existence, assumes a somewhat altered appearance, and has changed its parents, for it has now adopted the title "The New Hazell Annual and Almanack" (3s. 6d. net), and has passed under the joint control of the Oxford University Press and Messrs. Hodder and Stoughton. The main characteristic features of the old volume have been preserved in the new, and others have been added, and the volume, which is almost doubled in size, has been given an entirely new setting. The opening 52 pages, following upon a full index, are occupied with calendar and almanac matter, and naturally a great deal of space is devoted to the war (with maps) and matters arising out of it. The recommendations of the Paris Economic Conference are printed, and a whole mine of information appears relating to such matters as the Army and Navy, trade after the war, aviation, Parliament, industries, banking, education, and so forth. The sections on the British Dominions and Colonies and on foreign countries have been entirely rewritten, and embody full statistical information.

"Water Powers of Canada." Ottawa, Canada: Department of the Interior Dominion Water-Power Branch.

"*Proceedings* of the Physical Society of London." Vol. XXIX, Part 1, December 19th, 1916. London: The *Electrician* Printing and Publishing Co., Ltd. Price 4s. net.

Trade Announcements.—THE E.S. Co., LTD., of "The Light House," 233, Tottenham Court Road, London, announces that by an extraordinary resolution of the shareholders the capital of the company has been increased to £10,000. Mr. Vernon H. Wells, electrical engineer, late of Faraday House, Clarke, Chapman & Co., and the Westminster Engineering Co., Ltd., &c., has joined the board of directors, and he took up his duties as from January 1st. Mr. E. Cecil Beman, the founder of the company, remains managing director as heretofore. On the company's premises the latest applications and developments of electric lighting, heating, and power may be seen. The first annual dinner of the company was held at the Horse Shoe Hotel, Tottenham Court Road, on Friday evening, December 22nd, when the whole of the staff and a few friends interested in the company sat down. Mr. E. C. Beman, the managing director, presided, and Mr. V. H. Wells, the new director, was the guest of the evening. Both gentlemen delivered speeches appropriate to the occasion.

The name of the Anglo-Mexican Petroleum Products Co., Ltd., has been altered to the ANGLO-MEXICAN PETROLEUM Co., LTD. It will continue to market the products of the Mexican Eagle Oil Co., Ltd., including fuel oils, Diesel oils, lubricating oils, &c.

MESSRS. IRWIN & JONES, LTD., of London House, E.C., have been appointed sole agents in the United Kingdom and France for the sale of the "Hunt" storage battery industrial trucks manufactured by the C. W. Hunt Co. (Inc.), of America. The firm will also look after Messrs. Hunt's interests for elevating and conveying coal and general merchandise. Mr. Herbert A. Jones has just returned from an extensive tour in the United States and Canada, where he has been inspecting and studying modern methods of handling and transporting raw materials and finished products.

Fire.—The *Birmingham Daily Post* states that early on the morning of December 28th a serious fire was discovered at the Cable Works, Lydbrook. The generating station was found to be in full blaze, and practically the whole station was gutted before the arrival of the Ross Brigade. Fortunately, the main portions of the buildings were kept intact. The cause of the fire is a mystery. The whole works had been closed from the previous Friday. The damage is estimated at considerably over £1,000.

LIGHTING AND POWER NOTES.

Australia.—In order to augment the electric lighting plant at Barcaldine (Queensland), the Council proposes to install a battery.

The report of the Goulburn (N.S.W.) Municipal Electrical Department for the year 1915-16 shows a total revenue of £4,531, the average price per unit sold being 4·82d.; private lighting accounted for 102,107 units, realising £2,514; street and municipal lighting for 54,218 units and £1,098, and power for 69,992 units and £877. The accounts show a gross profit of £2,200, and after allowing for depreciation, &c., a credit balance of £1,518 is carried forward.

A scheme for the supply of electricity for lighting and power to Lilydale (Vic.) was considered at a meeting of ratepayers recently; the proposal is to utilise the river near Yarra Junction, from which sufficient power can be generated to supply the whole of the route (about 16 miles) with light and power, while probably many orchardists and agriculturists will become users of this cheap means of irrigation. The Lilydale Shire Council is to be asked to investigate the possibilities, and to approach the Upper Yarra Shire Council to co-operate. If the scheme outlined be carried on, Lilydale, Healesville, and Warburton, besides the smaller settlements on the line, could be adequately supplied.

The sanction of the ratepayers of the Moonta (S.A.) Council has been obtained to the borrowing of £4,000 for an electric light scheme. For more than 30 years the Y.P. Gas Co. has supplied coal gas to the business and private residences, but the price of the illuminant (15s. per 1,000 ft.) has not given satisfaction, and the ratepayers in business centres in many instances installed acetylene plants of their own.

A loan has been arranged by the Strathalbyn (S.A.) Council for the installation of electric light; it is proposed to obtain a second-hand plant from Melbourne.

The Yarram (Vic.) butter factory has given an option to Mr. V. J. Crowley on the whole of its electrical plant, which at present supplies power to the factory and for lighting the town, with the object of installing a hydro-electric scheme. A company has been formed with a capital of £10,000 for the purpose of carrying out the scheme.—*Commonwealth Engineer.*

The annual report of the Fremantle (W.A.) Municipal Tramways and Electric Lighting Board for the year ended August 31st last shows a gross profit of £17,000, being an increase of £574 on the previous year's working. The total income amounted to £63,113; the working expenses were £46,118. After providing for interest on loans there was a net balance of £10,640. The amount to the credit of depreciation reserve account at August 31st, 1915, was £22,613, to which a sum of £6,469 has been added.

By entering into an agreement with the Government for the supply of electricity for a period of 25 years, the Board has secured the right of supply within a 5-mile radius of Fremantle Town Hall; when the arrangements for the taking the new supply are completed the Board's power house will be closed down, and the capital cost of the plant, less residual value, will require to be written off against depreciation account. Land has been acquired for a sub-station building, and the necessary machinery and appliances will be installed, and this expenditure will be financed out of depreciation funds. A general rearrangement of the distributing mains will also be necessary, and all motors will require either rewinding or replacing.—*Commonwealth Engineer.*

Barnsley.—BULK SUPPLY.—The Corporation has given formal notice that it is making application to the B. of T., as the undertakers under the Barnsley Electric Lighting Order, 1890, for an Order permitting it to supply electricity in bulk to the Electrical Distribution of Yorkshire, Ltd.

Birmingham.—Councillors Beale and Appleby, two new members of the Electricity Committee, have been asked to inquire fully into recent failures in electricity supply and to present an independent report to the Council.

Bispham-with-Norbreck.—The Electricity Committee of the Urban District Council has decided that in future the charge for electricity for power purposes shall be 2d. per unit for the first 200 units per H.P. installed.

Canada.—NIAGARA POWER.—A meeting of the Ontario Hydro-Electric Radial Railway Association, at Toronto, recently passed a resolution calling on the Ontario Government to permit the Hydro-Electric Commission to expropriate the plant or product of the Canadian Niagara Power Co. and others developing power at the Falls. Sir Adam Beck stated that when the Chippawa development was completed energy will cost $7·5 per H.P.-year; he disagreed that Buffalo was being deprived of power, stating that the agitation was for the purpose of compelling the U.S. War Department to hand over an additional 4,000 cb. ft. per second of water from Niagara River.

Derby.—PROPOSED LOAN.—The Electricity Committee has recommended application for sanction to a loan of £34,000 for a 2,000-KW. turbine, rotary converter, boiler, economiser, &c., and works extensions.

Ealing.—YEAR'S WORKING.—The Council's electricity undertaking made a loss of £3,038 last year, after meeting financial payments of over £10,000. Coal cost increased by £2,459, rates by £667, insurance by £177, wages, bonuses, &c., by £775, making a total of £4,000; on the other hand, it was estimated, that but for the war £3,000 extra revenue would have accrued, and the profit would have been £4,000. After meeting the loss out of reserve, the latter stands at £13,000.

Edinburgh.—YEAR'S WORKING.—During the year ended May 15th, 1916, the Corporation electricity undertaking had a total revenue of £139,136; working expenses amounted to £79,477, and the gross balance was £59,659, resulting, after meeting interest and loan payments, in a deficit of £8,075 on the year. We note that the bulk of the revenue is credited to private lighting at the low war-time figure of 2½d. per unit, less discounts, and, after meeting the above deficit, the reserve fund stands at £102,183. During the year 17,373,558 units were sold, or rather less than in the previous year; private lighting accounted for 9,573,928, and power for 7,216,379 units.

Glasgow.—The Secretary for Scotland has now sanctioned the borrowing by the T.C. of a further £500,000 for electricity extensions, raising the authorised borrowing powers to £3,000,000. A licence has also been granted to proceed with the erection of buildings at the new Dalmarnock power-house site.

The Electricity Committee has recommended a contribution of £50 towards the expenses of the action pending between the Hackney B.C. and Gas Light and Coke Co. in regard to alleged preferential charges. The chief engineer has been authorised to furnish any available information to the Committees dealing with the question of interlinking electric supplies.

Halifax.—PUBLIC LIGHTING.—The Tramways and Electricity Committee has completed arrangements with the Luddenden Foot U.D.C. for supplying electricity in connection with public lighting within the district.

Hebden Bridge.—SUGGESTED BULK SUPPLY.—Inquiries are to be made of the Yorkshire Electric Power Co. and the Halifax Corporation as to terms for a bulk supply; also of Messrs. Willans & Robinson as to the price and time of delivery of an oil engine of equal power to that at present on the works.

Owing to increased costs of production, the Electricity Committee has decided that prices for electricity must be increased as from January 1st, 1917. Lighting charges are advanced 20 per cent., and power prices 25 per cent.; this is the first advance at Hebden Bridge since the war broke out.

HYDRO-ELECTRIC PLANT.—A small hydro-electric plant, utilising a fall of about 500 ft., has been installed in connection with the Old Town Mills. The plant is about half a mile from the mill, from which it is controlled electrically; it consists of a Pelton wheel running at 600 R.P.M., supplied by Messrs. Gilbert Gilkes, and fitted with a shaft governor, which, we gather, shuts off the water by a deflector, in case of accident, in a fraction of a second. In addition, needle control in the nozzle adjusts the water to the power requirements independently of the deflector, thus saving water. The electrical equipment was supplied by the General Electric Co., and consists of a 500-550-volt generator, supplying energy by an overhead line to a 630-R.P.M. motor, which drives the mill shafting through a Renold chain drive. The distant control consists of a hydraulic sluice operated by the piston of a hydraulic cylinder, the water supply to which is controlled by a magnet-operated four-way valve. The magnets are energised from accumulators, and electrically connected to the mill by wires on the overhead line, which also carries telephone and lighting wires. The installation was carried out by Messrs. Gilbert Gilkes and Co.

Hereford.—LOAN APPLICATION.—The T.C. has applied to the L.G.B. for sanction to a loan of £63,309, instead of £45,000, as orginally asked for, to meet the cost of installing additional generating and transmission plant.

High Wycombe.—PUBLIC LIGHTING.—The Electricity Co. having declined to modify the terms in settlement of its outstanding claim for public lighting—a payment of £100 per quarter, with an undertaking to renew the contract for seven years upon the expiration of the existing contract—the T.C. has decided not to extend the contract at the present time.

Holme.—The electricity company's balance-sheet for the past year shows that, after allowing £76 for depreciation of plant, there was a profit of £32. A dividend of 3 per cent. has been declared, and a balance of £25 carried forward.

Kirkcaldy.—EXTENSIONS REPORT.—Sir John Snell, in a report on the question of plant extensions, recommends that the existing station should be remodelled, the extensions to be spread over 10 years, at a cost of £61,300. An alternative proposal is that the Fife Electric Power Co. should acquire the existing station at, roughly, £38,000, to be paid within two years after the war, and supply in bulk for the Corporation's requirements.

Llandudno.—PROPOSED BATTERY.—A statement has been presented to the U.D.C. showing the profit or loss on the electricity undertaking from the time current was first supplied to the Light Railway Co. for traction purposes. The Council attributes the loss on working to the fact that no battery for small loads has been available. The electrical engineer has been requested to report fully on the question of providing a battery. The L.G.B. is also to be asked to authorise the necessary capital expenditure and the borrowing of the money.

New Zealand.—The report of the Christchurch Municipal Electric Lighting Department for the year ended March 31st, 1916, shows that there were 2,935 consumers, as against 1,623 in 1914-15, whilst the units sold were 2,260,672, as against 1,375,738.

The electricity department of the Gisborne B.C. in its annual report shows expenses totalling £9,623, against a total revenue of £10,515, leaving a balance to carry forward of £892. The generating plant comprises three 150-H.P. Diesel engines, but it is being extended by the installation of a steam plant—Babcock & Wilcox boilers and Belliss & Morcom triple-expansion condensing engines of 500 H.P. A hydro-electric scheme is also under consideration. The number of consumers is now 1,150. The tramway revenue amounted to £2,064 and the expenditure to £2,190; the tramway debit balance at date of accounts was £444. The cars are of the storage battery type.

The year's working of the Wellington Corporation Electricity Department shows a net credit balance of £10,558. The revenue from power supply and public lighting amounted to £12,763 (power £9,472, public lighting £3,291). The H.P. of motors connected at the power station was 4,058, and the average revenue per unit sold for power 1·99d. The revenue from private lighting was £67,623, and the H.P. of motors connected to electric lighting station 1,504.—*Commonwealth Engineer.*

The ratepayers of Tauranga have voted in favour of the Council borrowing £4,600 in connection with the completion of the electric lighting scheme.

Richmond-on-Thames.—The Guardians have approved of an increase of 20 per cent. in the charges of the Electric Light and Power Co. for power and heating as from the termination of the present quarter.

Shilton.—The Council has refused an offer to light 20 street lamps electrically at £2 per lamp for six months, and has adopted a scheme for using oil lamps.

South Africa.—For the quarter ended September 30th the working of the Cape Town Municipal Electricity Department resulted in a falling off in revenue, although a considerable increase in sales of energy occurred. Of 277,475 extra units sold, 275,809 were sold for power, the additional revenue from which was only £778, while during the same period the temporary closing of certain premises and the introduction of half-watt lamps resulted in a decreased lighting revenue. For the whole year it is estimated that the profit will be decreased by £3,500.—*S.A. Mining Journal.*

A hydro-electric plant of 110-KW. capacity has recently been constructed and put into operation at the mine of the Pigg's Peak Development Co. in Swaziland. Most of the equipment has been lying in disuse at this old Swaziland mine for some years, and the addition of this plant is likely to prove of service in increasing the gold output of the mine.

Stoke-on-Trent.—COOKING RATES.—With reference to electricity for cooking, the T.C. has decided that where domestic consumers are prepared to guarantee a minimum consumption of £4 per annum, energy in excess of this amount shall be charged at ½d. per unit.

Tasmania.—HYDRO-ELECTRIC REPORT.—In his second annual report on the State Hydro-Electric Department, the chief engineer and general manager (Mr. J. H. Butters) states that the contract entered into with the Electrolytic Zinc Co. of Australasia, Ltd., is the first step towards a revolution in the industrial life of the State, and is, he firmly believes, the forerunner of many large industrial enterprises in Tasmania which will require a large amount of hydro-electric power. In view of the contracts which have been entered into, and the contracts which are in negotiation, viz., with the Mount Lyell Co., the Launceston Municipal Council, and others, it has become essential to form some idea of the State's water power. A commencement has been made in this direction during the financial year; rain and snow gauges have been established throughout the Great Lake and Ouse detachment areas, and means of measurement of all the water passing the dam at the Great Lake has been established. Preliminary investigations are being made at Arthur's Lakes, Lake St. Clair, the river Derwent, and the Franklin River. The report states that the impression seems to exist that the Great Lake scheme is entirely a Southern one: that the Arthur's Lakes scheme, if proved, and when developed, will be for the North, whilst the Lake St. Clair scheme will be for the West. This is quite erroneous, as all the schemes on the central plateau would be interconnected. From conservative information available, says the report, it has been established that 70,000 H.P. can be developed from the Great Lake scheme after the Ouse diversion has been effected; but the policy of the Department would be not to load this scheme up to its full capacity until a number of years' readings have been obtained of actual discharge through the Great Lake sluiceways, and rather to recommend the development of one of the other schemes, which, in its turn, would be loaded up to, approximately, three-fourths of its calculated capacity, and so on; this Mr. Butters considers will conduce to the most satisfactory working.

The contracts which have already been secured will load up the southern line, and further large contracts will necessitate the building of additional transmission lines. The Department will induce manufacturers to establish in divergent centres such as Launceston and the West Coast, in order that the benefits of hydro-electricity may be distributed throughout the State, but the deciding factor in settling the site will be the manufacturers themselves.

Mr. Butters points out that the industries which will be likely to establish themselves in Tasmania are ones whose electric power costs represent a large proportion of their total annual costs, and which require a very large amount of electrical energy, which makes the power costs the most important factor of their operations—such as the electrochemical and electrometallurgical industries. This may be emphasised when it is noted that the whole of the requirements of the City of Hobart and its suburbs at the present moment amounts to less than 2,000 H.P., while one contract alone for an electrometallurgical industry will require 30,000 H.P. These electrochemical and metallurgical industries (*i.e.*, the primary industries) will be the first fruits of the hydro-electric investment, and they, in their turn, will induce a large growth in existing secondary industries, and also the establishment of additional secondary industries, &c.; these secondary industries, however, will neither require nor expect electric energy at prices much below what can obtained on the mainland; in fact, it may be stated that there are few secondary industries whose principal market is outside Tasmania, which would come here even if power were supplied free, as the extra shipping and marketing charges would more than outweigh this concession. The prosperity of the State, therefore, clearly depends upon being able to induce large primary industries to establish themselves.

Taunton.—STAFF SUPPLY.—The Electricity Committee recommends that the electrical engineer should in future have 2,000 units without charge, and be charged ½d. per unit for additional supply to his residence, which, by arrangement, was equipped with domestic electric appliances for light, heat, cooking and hot water supply, to provide facilities for inspection to prospective consumers, and to obtain data; the last year's consumption for all purposes was 5,757 units. The Committee has also decided to extend to any of its workmen an existing arrangement for supplying them at 1d. per unit, flat rate, on the understanding that on failures of the light such men should immediately report for breakdown duty.

Willesden.—LOAN SANCTION.—The Council has recently received sanction from the L.G.B. to raise £5,000 to cover the cost of laying a new direct-current feeder in order to meet the growing demand of local factories; this, together with recent sanctions for other extensions, will represent over £10,000 spent on developments of this kind.

Worthing.—PRICE INCREASE.—There will probably be a deficit at the end of next March (including the debit balance of £418 brought forward) of £1,984. An increase of 20 per cent. on the present charges during the next quarter would, if put into operation at once, reduce this deficiency by approximately £350, and it would also largely meet any deficiency in the coming year, assuming the war continues so long; and the Committee has accordingly recommended a further increase from 10 to 30 per cent. on the pre-war charges, with the exception of supplies registered by slot meters. It was stated that had the year been normal, the undertaking would have shown a profit of from £1,500 to £1,600.

TRAMWAY and RAILWAY NOTES.

Belfast.—Since Mr. Moffet, the new manager, assumed charge of the tramways he has instituted some beneficial changes. Amongst these is the much-needed electrically lighted numbering of the cars for showing the direction in which they are going. Although every car has been fitted with coloured lights for the past eight years, no attempt was made to utilise them as way-direction lights.

Blackburn.—The traffic returns for the Corporation Tramways for the week ended December 27th show that 240,897 passengers were carried, the number a year ago being 237,306. The receipts amounted to £1,252, an increase of £20 compared with last year.

Blackpool.—TRAFFIC RETURNS.—Mr. Charles Furness, general manager of the Corporation Tramways, reports that the month's receipts were £2,599, an increase of £133 compared with the same period last year. Passengers showed an increase of 76,947. From April 1st to December 14th the receipts were £81,105, an increase of £13,856 compared with the same period last year. The receipts during the whole of 1913, which were a record, amounted to £84,000; passengers this year show an increase of 2,780,094.

Bradford.—TRAMWAY *v.* RAILWAY FARES.—In connection with the new railway fares and reduction of facilities, a few interesting comparisons have been made at Bradford between the suburban railway service, under the new conditions, and the tramway service. The figures indicate the prospect of a heavy increase in tramway patronage, at the expense of the railways. Practically every place served by the railways around Bradford, and many which are not so served, are served by the tramways. Amongst some of the most startling comparative figures are the return fares for Thornton, railway 1s. 3d., tramway 4d.; Bingley, 1s. 4½d. and 6d.; Queensbury or Stanningley, 1s. and 6d. In regard to the linking-up of the city with other towns, the return fare by railway between Bradford and Leeds will be 2s. 3d., as against 1s. by car; Halifax, 2s., as against 1s.; Huddersfield (which has hitherto shown practically no advantage by tramway, owing to the circuitous route), 3s. 1½d., as against 2s. through, or 10d. by going *viâ* Brighouse, and walking to the Fartown terminus of the Huddersfield system.

TRAFFIC RETURNS.—The receipts of the Corporation Tramways for the 267 days of the current tramway year show an increase of over £10,000 on the corresponding period of the previous 12 months —£261,326 compared with £251,258.

Continental.—ITALY.—Messrs. Aroedi, Grippa & Co., of Milan, have submitted a scheme to the Italian Ministry of Public Works for the electrification of the secondary and complementary railways of Sicily. The electrification embraces 11 secondary lines, with two branches, serving 25 towns and cities, and seven complementary lines, with two branches, serving 28 towns and cities. The consumption, at present, of coal on all these lines is 70,000 tons, worth 3,500,000 pesetas, and a saving will be effected of 1,000,000 pesetas when the network is electrified. It is intended to use single-phase current at 11,000 volts pressure. The distribution will be made from a transforming and converting station at Nicosta, which will be fed from the central station of the Società Elettrica della Sicilia Orientale. The distribution will be made at 50,000 volts from 14 sub-stations, where the pressure will be stepped down to 11,000 volts.—*Industria e Invenciones.*

Edinburgh.—TRAMWAY PURCHASE.—The City Tramways Committee has recommended the acceptance of the Tramway Co.'s offer to sell the rolling stock, cables, and other plant to the Corporation for £50,000.

A Sub-Committee has been appointed to inquire into the present or prospective need for additional transport facilities between Edinburgh and South Queensferry, and as to what assistance would be given to the Corporation in the event of the facilities being provided.

Glasgow.—The valuation of the tramway undertaking by the Assessor of Railways and Canals for the year 1917-18 was reported to be £275,896, as against £269,087 for the previous year.

Mr. Dalrymple, the general manager of the Corporation Tramways, has addressed a memorandum to the traffic staff, in which he makes suggestions for the avoidance of accidents, which have been somewhat frequent recently.

Halifax.—The queue system of loading tramcars, and methods of maintaining order in loading and unloading usually associated with that system, are to be adopted early in the year. At first the adoption will be partial, and it will be extended to all routes as the passengers become accustomed to it.

Ilkeston.—TRAMWAY SALE.—The Notts. and Derbyshire Tramways Co. is asking for Parliamentary powers to take over the Corporation Tramways undertaking at an agreed price of £28,150, to be paid in instalments. The transfer would take effect as from September 30th last.

Leicester.—FARE INCREASE.—Owing to the additional expenditure required during the ensuing year, the Tramways Committee has found it necessary to increase the revenue, and has decided to fix a 1½d. fare for the full journey on all the tramway routes, with a 1d. stage on each route, and also to increase the fare for children to 1d.

London.—On Boxing Day, owing to an exceptionally high tide in the Thames, the railway in the vicinity of Kew Bridge was submerged, and the electric trains were for a time held up.

COOKING INSTALLATION.—According to the *Engineer*, the companies associated with the London Electric Railways have converted a building at Earl's Court Station into a club for their women employés, who number over 4,000, and have provided an electric cooking plant consisting of four baking ovens, a large boiler and steamer, boiling plates, grills, &c., for cooking 200 meals.

Luton.—ACCIDENT.—On December 28th last, a Luton car, descending a hill, left the track, and was wrecked against a bank, two persons being badly injured.

Newcastle.—In reply to complaints as to irregular tramway services, Mr. Hatton, the manager of the Corporation tramways, has submitted a statement showing that, despite the difficulties of the present situation, the passengers per week now number 1,509,000, as compared with 1,180,000 before the war; that during the war 696 new motormen and auxiliary motormen, 201 youths, and 528 women had been trained to fill vacancies, and that the engineering and maintenance staffs had been considerably depleted. The overhead construction had been well looked after, but the track could not be properly repaired. Many interruptions were due to slight defects in equipment, collisions due to inexperienced driving, overloading, and lack of lighting. It was surprising that they had done so well under the circumstances.

New Zealand.—The annual report of the Wellington Corporation tramway department for the year ended March 31st last records a total revenue of £187,864, as compared with £167,331 for 1914-15, and a net credit balance of £21,474. The car-mileage was 2,784,402 as compared with 2,521,692, and the passengers carried were 28,687,773 as compared with 25,517,515. During the year, 10 double saloon passenger and 1 freight car have been constructed, the rolling stock now numbering 112 vehicles; provision has been made to build and equip another 10 large cars during the present year. In view of the small margin of generating plant available for meeting emergencies, provision has been made in this year's estimates for the purchase of a 1,000-KW. mixed-pressure, geared turbine set. The average revenue per car-mile was 15·76d., the average working expenses 10·24d., and the average total expenses 13·86d.—*Commonwealth Engineer.*

Oldham.—LOST MILEAGE.—At a meeting of the Tramways Committee held on Thursday, December 28th, it was reported that 900 car-miles had been lost on the system during the past week through the fog and 520 car-miles were lost through snow.

Salford.—The Corporation Tramways Committee has agreed that the claim for time and a-half pay for Sunday labour shall be dealt with by the Committee on Production.

South Africa.—ELECTRIFICATION OF RAILWAYS.—The South African Railway Administration has under consideration the question of electrifying certain sections of the railway system. Sir William Hoy, the general manager, in a letter addressed to the Durban Town Council, states that in all probability consulting engineers will shortly be invited to South Africa to report upon a scheme which has already been drawn up. Some years ago a scheme was proposed to construct an electric railway between Johannesburg and Pretoria, and it would seem that from the point of view of possible traffic, both passenger and freight, the time is ripe for the revival of this scheme. Apart from uniting the two towns, and developing the intervening district, it would furnish an admirable and practical solution to the problem of finding work, not only for South African soldiers who are even now returning from G.E.A., but also for the great mass of industrial workers who are likely to be thrown out of work at the close of the war.

The original promoter of this electric scheme was Dr. William Macdonald, who, with the then Mayors of Johannesburg and Pretoria (Mr. H. J. Hofmeyer and Sir Johannes van Boeschoten), proposed a route some 10 miles shorter than the existing steam line to Pretoria. The cost was estimated at £400,000, and it was then affirmed by the S.A.R. Administration that the profits were likely to be so large that the new railway would more than pay for the possible loss on the old route. The capital required to construct this line was offered by more than one private firm, who saw the enormous potentialities of such a line. Power was offered, it is understood, by the Victoria Falls E.P. Co., and the then general manager of the S.A.R. was heartily in favour of the scheme.

The scheme was shelved in consequence of opposition from the outset by certain Cape members of the Cabinet at that period, who did not look with favour upon the linking-up and closer union of Pretoria with Johannesburg.

TELEGRAPH and TELEPHONE NOTES.

Breaking Insulators.—On December 27th, seven youths were fined 15s. each for throwing stones at telegraph insulators at Habergham Eaves. Mr. J. H. Callis, of the Sectional Engineers' Office, Blackburn, stated that no fewer than 300 insulators had been broken at this particular section in 1916.

At a Children's Court at Preston, on Monday, five young boys were fined for stone-throwing at insulators. It was stated that in Cadley Lane, Fulwood, alone, 150 insulators had been broken, and on one section £400 damage had been done to insulators during the past nine months.

Iceland.—The Great Northern Telegraph Co. of Denmark announces that its rates have been reduced to Iceland and the Faroe Islands to 4d. and 3d. per word respectively.

Spain.—The new postal headquarters at Madrid is to be equipped with wireless telegraph and telephone apparatus of the latest models. The transmitter will be of the same type as that which made possible the transmission of the human voice from New York to Honolulu and Paris. The antenna will be carried by four iron posts mounted on towers on the top of the building. From the central tower, 90 metres high, wires will be led to the other three posts, two at the front of the building and the other in the rear. The receiving apparatus will include some type of telephonic relay, enabling the intensity of the feeble current received to be amplified 500 times.—*Industria e Invenciones.*

United States.—A Bill forbidding foreign ownership of wireless stations within the United States is being prepared.—*The Times.*

CONTRACTS OPEN and CLOSED.

OPEN.

Australia.—SYDNEY.—Feb. 19th. Municipal Council. Meters, maximum-demand indicators, feeder regulators. Specification from E.L. Department, Town Hall.

January 22nd. Deputy P.M.G. Nine electrically-controlled clocks for Newtown Post Office.*

PERTH.—January 10th. P.M.G.'s Department. Telephone instruments and parts. See "Official Notices" December 15th.

MELBOURNE.—January 31st. Department of the Navy. Dynamos, switchboard, motors, balancers, and control gear, for Flinders Naval Base. Specifications from the Director of Naval Contracts, Melbourne.*

March 5th. Council. One 7,500-K.V.A. turbo-alternator. See "Official Notices" to-day.

Bootle.—Corporation. Tramway rails. See "Official Notices" December 29th.

Glasgow.—The chief engineer of the Corporation Electricity Department has been authorised to obtain tenders for the supply of one 6,000-KW. turbo-generator set to meet the demands of the winter of 1917-18.

New Zealand.—TAURANGA.—February 12th. Borough Council. Supply of six three-phase transformers, 11,000-400 volts. Messrs. H. W. Clime & Sons, Consulting Engineers, Raetihi.—*N.Z. Shipping and Commerce.*

South Africa.—DURBAN.—February 12th. Six four-ton electric travelling portable jib-cranes for the harbour.*

Spain.—Tenders have lately been invited by the municipal authorities of Caceres (Province of Caceres) for the concession for the electric lighting of the town during a period of 15 years. The municipal authorities of Torroella de Montgri (Province of Gerona) have also lately invited tenders for the electric lighting of the town.

West Ham.—January 11th. Corporation. One water-tube boiler, one 3,000-KW. turbo-alternator. See "Official Notices" December 29th.

Wigan.—January 8th. Tramways Committee. 30-H.P. motor tower-wagon. Mr. Frank Buckley, General Manager, Market Place.

Specifications for the items marked * can be seen at the Board of Trade Commercial Intelligence Department in London.

CLOSED.

Aberdeen.—Corporation Tramways Committee. Four electric motors for cars: British Thomson-Houston Co., Ltd.

Aldershot.—On the recommendation of the B. of T., the U.D.C. has renewed a contract for 1,200 tons of small coal for the electricity works, at £1 3s. 6d. per ton.

Glasgow.—The Statute Labour Committee has accepted the offer (£132) by Messrs. Wm. Anderson, Ltd., for additional wiring at the harbour tunnel.

Messrs. Wm. McGeogh & Co., Ltd., have secured the contract to supply the electrical materials to the T.C. Cleansing Department for the next six months.

Salford.—Gas Committee. Accepted tender:—12-H.P. electric motor: Messrs. Mather & Platt, £123.

The Electricity Committee has accepted the offer of Mr. J. Heaton for 2,500 tons of Tyldesley No. 1 slack coal under the conditions of the existing contract (approximately £2,333).

The General Purposes Committee has considered the contract entered into with Messrs. E. M. Evans & Son for the maintenance of the intercommunication telephone system for the Finance Committee, and has recommended the Council to agree to the payment of an increase of 20 per cent. in respect of the same, the Council reserving the right to reconsider the matter on the termination of the war, should such event take place prior to the termination of the contract.

Surbiton.—U.D.C. Two electrically-propelled dust vans: Edison Accumulators, Ltd., £1,025 each.

FORTHCOMING EVENTS.

Institution of Post Office Electrical Engineers (London Centre).—Monday, January 8th. At 6 p.m. At the Institution of Electrical Engineers, Victoria Embankment, W.C. Paper on "The Story of the Keyboard Perforator," by Mr. H. H. Harrison.

Liverpool Engineering Society.—Tuesday, January 9th. At the Royal Institution, Colquitt Street. Paper on "Screw-Measuring Apparatus," by Mr. A. Brooker.

Institution of Civil Engineers.—Tuesday, January 9th. At 5.30 p.m. At Great George Street, S.W. Paper on "Recent Progress in Dredging Machinery," by Mr. W. Brown.

Association of Engineers-in-Charge.—Wednesday, January 10th. At 8 p.m. At St. Bride's Institute, Bride Lane, E.C. Paper on "The Design and Construction of Industrial Premises," by Mr. A. Alban H. Scott.

Greenock Electrical Society.—Thursday, January 11th. At 7.45 p.m. At 22, West Stewart Street. Paper on "Factory Installations," by Mr. R. T. Paterson.

Institution of Electrical Engineers.—Thursday, January 11th. At 8 p.m. At Victoria Embankment, W.C. Paper on "Principles Involved in Computing the Depreciation of Plant," by Mr. F. Gill and Mr. W. W. Cook.

(Scottish Local Section).—Tuesday, January 9th. At 7 p.m. At Princes Street Station Hotel, Edinburgh. Paper by Messrs. Gill and Cook.

(Yorkshire Local Section).—Wednesday, January 10th. At 7 p.m. At the Philosophical Hall, Leeds. Ordinary general meeting.

THE MINISTRY OF MUNITIONS AND COPPER.

THE Minister of Munitions has issued the following Notices and Orders, dated January 1st, respecting copper supplies:—

1. He hereby takes possession as from the date hereof until further notice upon the terms specified in the Schedule hereto of all unwrought copper, including copper scrap and swarf, in any form whatsoever subject to the following exceptions:—

(*a*) Rough copper, copper ore and copper scrap, and swarf, in the possession of, or due under an existing contract in writing for future delivery to, a smelter or refiner for the purpose of conversion into refined metal.

(*b*) All copper, including copper scrap and swarf, in the possession of or due under an existing contract in writing for future delivery to a manufacturer for use in such manufacturer's own works.

(*c*) Copper scrap and swarf specially excepted under the written authority of the Minister of Munitions.

2. If any person having control of any metal to which this notice applies without the consent of the Minister of Munitions sells, removes or secretes it, or deals with it in any way contrary to any conditions imposed in any licence or permit that may have been granted in respect thereof, he will be guilty of an offence against the Defence of the Realm (Consolidation) Regulations, 1914.

3. All existing licences issued by or on behalf of the Minister of Munitions for dealing in any scrap or swarf to which this notice applies are hereby cancelled.

4. The Minister of Munitions hereby requires every smelter or refiner to make a return to the Director of Materials at the end of each calendar month, including the month of December, 1916, of the total quantities of refined copper of each description in stock, distinguishing between (1) that sold for use on Class "A" or Class "B" work; (2) that allocated for such use in his own works; and (3) the residue not so sold or allocated. And he further requires every maker and holder of copper scrap or swarf to make a return to the Director of Materials at the end of each calendar month, including the month of December, 1916, of the total quantities of each class of such scrap or swarf in stock, distinguishing between (1) that sold for use on Class "A" or Class "B" work, (2) that allocated for such use in his own works, and (3) the residue not so sold or allocated.

5. All applications with regard to this Order should be addressed to— The Director of Materials, A.M.2.B., Armament Buildings, Whitehall Place, London, S.W., and marked "Copper Permit."

The before-mentioned Schedule referred to:—

(*a*) Copper included in the Returns made in accordance with Clause (2), Sections (*a*), (*b*) and (*c*) of the Order made on December 8th, 1916, and taken over under the above Order (except copper due for future delivery on sliding-scale terms) will be paid for on delivery by the Minister of Munitions on the basis of the value as indicated by the average of the official quotations of the London Metal Exchange for the last 15 days of December, 1916.

Copper due for future delivery on sliding-scale terms will be paid for at not more than 10s. per ton of metal over the original full contract terms, including all discounts, commissions, or rebates of any sort.

Special circumstances in connection with any copper taken over may be taken into consideration by the Minister.

(*b*) A Price Schedule for copper scrap and swarf based downwards on the quotation for electrolytic copper as a standard will be drawn up by the Director of Materials for the purpose of the taking over of stocks under the above Order, and as a basis for future transactions.

(*c*) The quantities of refined copper specified in the returns of smelters or refiners under Clause (4) of the above Order and not sold or allocated as therein mentioned, will be paid for on delivery by the Minister at the average of the relative official quotations of the London Metal Exchange for the month in question.

(*d*) The scrap and swarf specified in the returns by makers and holders under Clause (4) of the above Order and not sold or allocated as therein mentioned will be paid for on delivery as may be directed by the Minister on the basis of the average of the quotations for electrolytic copper for the month in question, subject to any adjustments for quality that may be necessary.

(*e*) In all cases where two prices are quoted for the same description of copper by the London Metal Exchange, the price paid by the Minister, if based thereon, will be the mean of the two prices, and all prices paid by the Minister will be net per ton delivered c.i.f. U.K. port if imported from abroad, or free on rail at the producers' works if made in England, or equal thereto.

NOTES.

An Electrical Trap.—A Cape Town firm missed a number of brass fittings from fire extinguishers, but could not trace the thief. A powerful electric charge was therefore applied to certain apparatus. Subsequently one of the firm's employés—a coloured man named Michael Brown—was found to have received a severe shock, and without saying anything to him about the matter the firm informed the police, with the result that Brown, who had nothing to say, was found guilty, and was ordered to pay £5 fine, or to do one month's hard labour.

Flash-lamps without Batteries.—The great convenience of portable and pocket "flash-lamps" is discounted to quite a considerable degree by the short life of the dry cells generally employed. A practicable flash-lamp without a battery—either primary or secondary—sounds almost too good to be true, yet, according to *L'Industrie Electrique*, the feat has been accomplished in Germany by utilising a tiny magneto-generator driven by a spring and clockwork. The mechanism is provided with an escapement which ensures constant speed of revolution for the generator armature, and hence constant voltage. Apart from the advantage of these lamps in service, they can, of course, be kept in stock indefinitely without deterioration, whereas so-called dry cells only work when they are moist, and are rarely worth much three months after they are made. There is no doubt that a clockwork mechanism can develop sufficient power to light a small lamp. The ordinary flashlamp bulb generally requires 0·15 ampere at 3 volts—*i.e.*, less than ½ watt. A man working a crank can develop 100 watts easily, and he can store sufficient energy to light a half-watt lamp for some time in a spring which can be wound up by his fingers. Our contemporary is certain that French manufacturers will take up promptly this interesting innovation, which has so many useful applications. Nothing is said about the initial cost of the apparatus, which must be much greater than that of the battery lamp; but by manufacturing in great quantities it should be possible to bring it down to reasonable limits.

Low Wages of Women Electrical Workers.—The *Times* recently reported Miss Mary Macarthur, hon. general secretary of the National Federation of Women Workers, as saying that "'in electrical engineering . . . there are women earning very small wages. . . . Last week a girl of 19, with five brothers at the Front, who was only earning 9s. 9d. for a 52½-hours' week at stator winding, was refused a leaving certificate." 2·23d. per hour!

Battery Patent for Sale.—The Svenska Ackumulator Aktiebolaget Jungner, of Stockholm, is offering for sale or licence several patents for "Improvements in electrical accumulators." A notice on the matter appears among our advertisements to-day.

"Electric Light Switching."—The results of the Second Batch Examination in this subject are given below. Those desiring further particulars should communicate with Messrs. A. P. Lundberg & Sons, 477-489, Liverpool Road, London, N.

Candidates whose papers were in time for this batch, and who do not find their names below, have failed to qualify.

Advanced Grade (in Order of Merit).—W. A. McCall (Blackburn), H. Grimshaw (Golborne, Lancs.), J. J. Rogers (Dundalk, Ireland).

Intermediate Grade (in Order of Merit).—John Moran (Bury, Lancs.), R. H. Lawrenson (Romsey, Hants.), T. A. Holt (Birmingham), N. A. Jassawalla (Karachi, India), S. Booth (Warrington), J. Prime (Stafford), E. Emery (Old Hill, Staffs.), Sapper N. A. Robinson (Beaumaris), J. Wright (Grimsby), W. M. Fowler (Grimsby), W. R. Clements (St. Margaret's-on-Thames).

Worked another Paper.—J. Bibb (London, S.W.), D. H. Keeling (H.M.S. *Ajax*).

Preliminary Grade (in Order of Merit).—H. M. Osborne (Birmingham), R. F. Galea (Malta), P. F. Hood (Leith), J. Pendleton (Sheffield), "Parwin" (Hinckley, Leicestershire), H. Pritchard (Rhymney, Mon.), W. F. D. Morgan (Tredegar, Mon.), M. C. Stoker (Manchester), S. Addyman (Leeds), R. P. Gilbert (London, N.), D. L. Little (Rugby), G. Doudney (London, S.E.).

Worked another Paper.—A. J. Tourle (Dunstable), R. C. Stripp (London, N.W.), J. Hamer (Dewsbury), Sapper R. Rees (B.E.F.).

Electrical Table Cloths.—The Board of Trade Department of Commercial Intelligence has received an application for the names of makers of electrical table cloths.

Trade with Portugal.—A local agent at Lisbon desires to get into touch with British suppliers of electrical materials and installations for electrical lighting.—*Board of Trade Journal.*

The "Safety First" Campaign.—The Council for the "Safety First" campaign of the London General Omnibus Co., which was appointed at the recent conference, is now complete, and Mr. H. E. Blain, operating manager of the company, expects that in the course of a week or two the campaign will be in working order. It is understood that the Council will at once appoint a number of Special Committees to deal with every form of street danger.—*The Times.*

Volunteer Notes.—FIRST LONDON ENGINEER VOLUNTEERS.—Headquarters, Chester House, Eccleston Place.—Orders for the week by Lieut.-Col. C. B. Clay, V.D., Commanding.

Friday, January 5th.—Technical for Platoon No. 10, Regency Street. Squad and Platoon Drill, No. 9. Signalling Class. Recruits' Drill, 6.25—8.25. Lecture on "Telephones," 7.30.

Saturday, January 6th.—Commanding Officer's Parade, 2.45 (uniform), for drill in Battersea Park.

Sunday, January 7th.—Entrenching at Otford. Parade, Victoria (S.E. & C.R. Booking Office), 8.45 a.m.

Special Order.—General Sir Desmond O'Callaghan, K.C.V.O., desired that his complete satisfaction with all that he had seen on his inspection should be recorded in the orders.

(By order) MACLEOD YEARSLEY, *Adjutant.*

American Profit-Sharing.—The *Electrical Review and Western Electrician* states that the Consolidated Gas Co. and the New York Edison Co., and their affiliated companies, have adopted a profit-sharing plan. An official statement on the matter says:—"It is increasingly recognised that profit-sharing in some form promises more than anything else to stimulate the interest of employés in the success of the undertakings with which they are identified. This relationship tends especially to promote individual and collective effort and a better spirit of co-operation in the various departments of the complex organisations now required by the larger public-utility corporations that they may render satisfactory service. The directors of these companies have decided to pay all employés, other than those of the executive and administrative staff, receiving not over $3,000 per annum, a percentage upon their salaries or wages equal to the dividend rate paid to the stockholders of the Consolidated Gas Co. Quarterly dividends are now paid at the rate of 7 per cent. annually, and, consequently, these employés—some 17,000 in number—will receive a like rate, which will approximate $1,000,000 annually, in addition to their salaries and wages." The first payment was to be made on December 15th, 1916, to all employés who, on November 30th, 1916, had been six months or longer in the service of the companies.

Tramway Men and War Wages.—At a sitting of the Bradford Munitions Tribunal, last week, 55 employés of the Bradford Corporation Tramways Department complained that the department had refused leaving certificates. The case of William Wood, a fitter, was taken as a basis. Ald. A. Taylor, of the Amalgamated Society of Engineers, representing the men, said their reason for wishing to leave was their allegation that they were not receiving the standard rate of wages. In October an award fixed the standard rate in the engineering trade in Bradford, and the Tramways Committee, so far, had not carried out the terms of the award, or given the men the full benefit of it, and they had refused leaving certificates. Wood said his wages were 41s. per week, whereas the standard was 44s., but he received a bonus of 3s. In the granting of the bonus nothing was said about any award which might be made. He said the men had refused to accept a suggestion that the matter should be placed before the Committee on Production, for arbitration. Mr. C. J. Spencer, manager of the Tramways Department, said the Committee were as anxious as the men for payment of the standard rate. The majority of the Committee considered that they were already paying the standard rate, and it would be bad policy and dangerous to pay more than that rate. They held that the difference between war wage and war bonus was as the difference between "Tweedledum and Tweedledee." The bonus was paid as ordinary wages by a special resolution of the City Council. As to the leaving certificates, the Committee had offered to submit this to arbitration by the Committee on Production as a third party, and in refusing this offer, he submitted, the unreasonableness was on the side of the men. Ald. Taylor said the bonus could not be regarded as wages, and could be removed by resolution, and the men could not sue for it. The Chairman of the Tribunal said he was sorry to have to say the Bench were not unanimous. The majority decision—of himself and the representative of the employers' panel—was that the bonus of 3s. ought to be considered as part of the wages, and that the refusal to grant leaving certificates was not unreasonable, and this was the decision of the Court. Mr. Moody, of the employés' panel, dissented from this view. Ald. Taylor intimated that the other cases would be withdrawn.

A French View on Trade Policy.—With a view to reviving the manufacture of machine tools in France, the Ministre du Commerce has invited the opinions of the various Chambers of Commerce throughout France on ways and means, as a preliminary to immediate official action. The invitation has brought forth a remarkable contribution from Mons. O. Arnodin, forwarded through the Orleans Chamber. The writer referred to the placing by the French Government of an order for 100,000 fr. worth of machine tools abroad, because the French manufacturers' price was 110,000 fr., or 10,000 fr. above the foreign quotation. By this order leaving France, he contended the nation was impoverished to the extent of the value of the order. The sum disbursed by the French suppliers would have gone in purchase of raw materials, wages of workmen, profit, &c., and as raw materials were only the workman materialised, the amount would be distributed among the population in the purchase of food and clothing, rent, and all the requirements of life, a portion going to the State in the shape of taxes. It was a crime on the part of the State to purchase abroad, and notably in Germany, in normal times, machine tools which could be produced in France. The author also related an electrical transaction in which this country was concerned, and which illustrates Germany's unscrupulous methods. The instance came under the writer's own eyes in the course of a visit to the Felten und Guilleaume Kabelwerke, at Mülheim-am-Rhein, in 1900. The German Government had decided to lay a submarine cable connection with America. As hitherto German manufacturers had not experimented in the making of this kind of cable, the German firm named was asked to make a preliminary study of the question, and accordingly sent a delegate to English manufacturers, surreptitiously to investigate the methods of manufacture. Thereafter the German Government instituted what might be called a "preliminary" international competition, in which offers were solicited, with descriptive schemes; but the right was retained to accept or refuse any offer, even though it might be the most advantageous. Naturally, the English manufacturers, skilled in this class of work, and with well-equipped factories, submitted offers much below that of the Felten und Guilleaume Kabelwerke; the German Government then communicated the details of the English schemes to the German firm, and called upon it to make a lower offer on the occasion of the final adjudication. After a further severe revision of its prices, this firm found itself still unable to touch the English quotations, save at a ruinous loss. At this juncture, the thought occurred to it to call together its workmen, mostly members of the Socialist Syndicate, and these, after examining the situation, decided to accept such a reduction in their wages as would enable their principals to compete, it being understood that the wages would return to the normal so soon as the contract, estimated at 25,000,000 fr., was completed. The outcome of this manœuvre was that the cable was made in Germany, which was the object aimed at.

The Electrical Vehicle Committee.—Mr. Frank Ayton, the hon. secretary, informs us that, as a result of correspondence between the Electric Vehicle Committee and the Ministry of Munitions, a tentative arrangement has been agreed to by the latter under which the firms at present manufacturing electric vehicles in this country will be allowed, for the time being, to manufacture such vehicles for purposes of urgent national importance. The firms, however, are required to apply for a permit in the case of each order that they desire to put through their shops. The firms referred to are Messrs. Ransomes, Sims & Jefferies, Ltd., Messrs. Edison Accumulators, Ltd., Messrs. Electromobile (Leeds), Ltd., and Messrs. Richard Garrett & Sons.

The Committee has received a notification, dated December 29th, from the Board of Trade, Department of Import Restrictions, stating that on and after the 29th ult. it will not be possible to consider the granting of licences for the importation of motor-cars or chassis:—(1) If imported fully assembled; or (2) if imported in parts, unless permission to assemble has first been obtained from the Ministry of Munitions, and the application is accompanied by licence so granted.

The Board requests that immediate steps be taken to prevent the shipment of any further consignments of motor-cars, chassis, and parts and accessories thereof.

Electric Steel Furnace.—At the annual general meeting of the National Steam Car Co., Ltd., on the 29th ult., the chairman stated that, anticipating difficulty in obtaining steel, the company had erected an electric steel furnace and foundry at Chelmsford. By this means they were not only able to produce wheels and castings for their buses and transport vehicles, from their scrap material, but were also supplying steel to Sheffield. The business ought to be continued after the war, and would render the company independent of outside sources for all steel castings in the future.

Linking-up Electricity Works—West of England Area.—As briefly mentioned in our last issue, a meeting convened by Mr. W. J. Bache, borough electrical engineer, Cheltenham, was held at the Merchant Venturers' Technical College, Bristol, on the 18th ult. The following gentlemen were present:—Messrs. W. J. Bache (Cheltenham Corp.), G. Charlton (Weston-super-Mare E.S. Co.), F. Christy (Portishead and Mid-Somerset E.S. Cos.), H. Faraday Proctor (Bristol Corp.), J. A. Purves (Blandford, Burnham, Dorchester, and Swanage E.S. Cos.), W. G. V. Smith (Bristol Tramways Co.), and F. Swarbrick (Minehead E.S. Co.).

Messrs. J. H. Bolam (Weymouth Elec. Dept.), A. B. Randall (Salisbury E.L.S. Co.), and F. H. Corson (Gloucester Corp.) were unable to be present.

After an introductory statement by the convener, Mr. H. Faraday Proctor (joint hon. secretary to the National Electric Power Supply Joint Committee) outlined the history and progress of the movement. He stated that the question had been raised as to the outlook for the smaller undertakings; this was given very early consideration, and it was laid down by the Joint Committee at its meeting on June 23rd:—"That in formulating any linking-up proposals existing areas and rights should be preserved." It was felt that the output of the smaller undertakings was likely to be much improved. He did not anticipate that very much could be done immediately in the West of England area, but strongly advocated the immediate appointment of a General Committee and a working Sub-Committee, that statistics and data should be prepared of the whole of the undertakings in the area, and that preliminary consideration should be given to the practicability of linking-up existing undertakings. These preliminaries could best be considered by engineers only and from the engineering standpoint, hence this meeting was confined to the chief engineers of the undertakings in question. A little later on they must include the representatives of the company boards and municipal committees. He expressed the hope that everyone would co operate and facilitate to the best of his ability the preparation of data; although the linking-up of his particular undertaking might not yet be possible, ultimately it would most certainly come. Electrification of railways and the development of electricity in agriculture might both be conducive to hastening the matter. The West of England area as defined was unfavourable for a linking-up scheme of any magnitude, but Mr. Proctor mentioned the probable linking-up of Bristol with Bath and Portishead.

Mr. Christy inquired whether it was the intention to "swallow up" the smaller undertakings, and Mr. Verdon Smith asked as to the compensation for displaced officials. Mr. Swarbrick stated that farmers would welcome a supply if it could be obtained, and referred to what had been done in this connection at Hereford. Mr. Charlton remarked that his undertaking would welcome the prospect of obtaining cheap electricity, which seemed probable under a linking-up scheme.

Mr. Proctor having replied to some of the points raised, it was decided to form a General Committee which should comprise all those who had been invited to the meeting that day, with Mr. Corson as chairman and Mr. W. J. Bache as vice-chairman and secretary.

A Working Sub-Committe was also appointed, consisting of Messrs. H. Faraday Proctor, F. Teague, A. Dimmack, and J. H. Bolam, representing local authorities; and F. Swarbrick, F. Christy, and G. Charlton, representing companies. The following matters were referred to the Sub-Committee:—Consideration of extent of area; report on plant capacity and requirements; standardisation; consideration of provision of capital required for linking-up; suggestions as to possibility of immediate linking-up of specific districts.

The Training of Disabled Soldiers.—A school for training disabled soldiers has been started by the Newcastle Electric Supply Co., Ltd., with the active support of the Institution of Electrical Engineers. The school is at the Wallsend generating station of the company. Theoretical and practical training is being given in the control of switchboards, after which it is hoped to find permanent employment for large numbers. The period of tuition is four hours a day for six weeks. The men are to be under 35, and have fairly good use of their limbs, although the loss of an arm or a leg is not an obstacle to their employment. During the tuition period the men are being paid 25s. a week, and they will subsequently earn 30s., with 8s. 6s. war bonus. When the men now in training have received six weeks' tuition there will be vacancies for a fresh contingent, and it is not improbable that the scheme may be considerably extended.—*Yorkshire Post.*

Institution and Lecture Notes.—The Institution of Electrical Engineers.—At a meeting of the DUBLIN LOCAL SECTION on December 22nd, a paper was read by Mr. J. P. Tierney on "The Use of Electricity for the Industrial Development of Ireland." Mr. Tierney said that whilst the mineral and industrial resources of England had been developed to their fullest, the corresponding resources in Ireland had hardly been considered. Nearly all the electrical power supply of the country was obtained from sea-borne fuel, the cost of which had been very high. Although about 93,000 tons of coal were mined in Ireland in 1914, in no single instance was there a main-line railway siding into any Irish coal mine, so that the coal had to be transported by road carts. The result was that the people of Dublin were paying 45s. per ton for coal, whereas Irish coal was being sold at the pit's mouth in Athy for 15s. per ton, the actual distance from Athy to Dublin being 45 miles. The Advisory Committee for Scientific and Industrial Research should devote some money for the purpose of ascertaining the exact value of Irish coal. As to the development of the peat industry, the only proper course was the erection of a power station practically in the centre of the peat area. The question of the utilisation of Irish peat for power production was one to which the Local Section should direct the attention of the Advisory Committee.

Mr. David Sherlock, in the discussion, said that a sum of £1,000,000 had been allocated to these purposes.—*Irish Times.*

Meetings of the YORKSHIRE LOCAL SECTION will take place at Leeds on the following dates:—January 10th, February 21st, March 21st, April 25th, and May 9th.

Belfast Association of Engineers.—A lecture was delivered on December 21st by Mr. A. W. Brown, on "Water Power in Ireland," Mr. Brown said it would be quite possible to bring power to Belfast from Strangford Lough, which offered very promising possibilities. There would be some 20 sq. miles of it available; it was fed by the sea through a narrow channel 4 miles long and from ¼ to ½ mile wide. The spring tides had a rise of 14½ ft. and the neap tides a rise of 11½ ft., with a range of 7½ ft. To utilise this power to the full, storage batteries of very large capacity would be needed. The power available at the turbines would be some 60,000 to 10,000 W.H.P. The amount of capital expenditure required would be about £1,120,000, and the saving over a steam-driven plant would be about £20,000 a year.

Appointments Vacant.—Shift engineer, for Atherton power station (50s.); telephone construction foreman, for Ceylon (£300); assistant constructional engineer, for the Birmingham Corporation electricity supply department (£250). See our "Official Notices" to-day.

Extension of Letters Patent.—It is announced that application for extension of term of the following Letters Patent is to be made by Dr. S. Z. de Ferranti and Mr. E. S. Coats:—

"Improvements in and relating to spinning, twisting, and doubling machinery," August 20th, 1903. No. 18,047. S. Z. de Ferranti.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials.—For the position of chief engineering assistant to the Leeds electricity department, rendered vacant by the appointment of Mr. Robert Owen as borough electrical engineer of Wigan, 78 applications were received by the Electricity Committee, and the following were selected as a short list:—Mr. J. R. Davison, B.Sc., A.M.I.E.E., of Manchester; Mr. R. W. Grubb, M.A., A.M.I.E.E., of Dewsbury; Mr. Ernest A. Mills, A.M.I.C.E., of Birmingham; Mr. Ernest Porter, Leeds; and Mr. W. Yorke, A.M.I.E.E., of Sunderland. The Committee, after visiting Sunderland and Birmingham, recommended Mr. ERNEST A. MILLS to the Council for appointment, and the matter was to come before the City Council on Wednesday. The salary attaching to the position is £350 per annum.

The Salford Electricity Committee has recommended the Council to increase the salary of the second mains engineer from £130 to £150 per annum, and to fix £150 per annum as the maximum for the position. The scale previously fixed the minimum salary at £100, rising to a maximum of £135.

On the occasion of Mr. J. B. MORGAN resigning his post as electrical engineer to the Horsham Urban Council, the works' staff presented him with a case of pipes and a fountain pen. Mr. Morgan has now taken up his duties as works manager at the Horsham Engineering Works.

General.—On Friday last, at the Grand Hotel, Bristol, a few friends from the West of England and South Wales gave a presentation dinner to Mr. PERCIVAL F. CRINKS, in order to give him a hearty send-off on his removal from the West of England to take up an important position on the London staff of the British Westinghouse Co. Mr. H. Faraday Proctor presented Mr. Crinks with a handsome gold English lever watch, and a gold wristlet watch for Mrs. Crinks. Mr. Proctor spoke of the connection of Mr. Crinks with the Bristol Corporation prior to his joining the Westinghouse Co., and said a man's worth was only appreciated by a department after he had left it. Mr. Crinks resopnded to the toast. Mr. G. H. Hedley (managing director, St. Anne's Board Mill) proposed the health of the Chairman (Mr. W. H. J. Porter, district manager of the British Westinghouse Co.), who suitably replied. Mr. Porter spoke in eulogistic terms of Mr. Crinks's connection with the South Wales office, and other speeches were delivered by Mr. H. I. Rogers (Messrs. Brecknell, Munro & Rogers), Mr. A. J. Newman (deputy engineer, Bristol), and Mr. A. H. Dowson (Veritys, Ltd.). The singing of the National Anthem and "Auld Lang Syne" terminated a very enjoyable evening. During the evening musical items were contributed by Mr. A. Fisher (Ashton Vale Coal & Iron Co.) and Mr. F. Clifford (Imperial Tobacco Co.). Those present included, in addition to the gentlemen mentioned above:—Messrs. J. B. Lewis, D. H. Duff, G. W. Matthews, J. Plevin, and R. Wenning, of the Cardiff office of the British Westinghouse Co.; Mr. F. W. Prosser, sales manager and secretary, Bristol Corporation; Mr. A. J. Brooks, station

superintendent, ditto; and Mr. I. A. D. Pedler, mains engineer, ditto.

Mr. J. L. Chalmers, chief electrical engineer to Messrs. Bean & Son, of Dudley, on the occasion of the first anniversary of the establishment of the electrical department of the firm, has been presented by the staff with an illuminated address and a gold albert.

The *Commonwealth Engineer* states that Mr. J. D. Waern, of Messrs. Gardner, Waern & Co., has returned to Australia *viâ* America, from a business trip to Great Britain and Sweden. "It is the intention of the firm to embark, in conjunction with some of their principals, on the local manufacture of electrical and other plant."

Ald. J. W. Henderson has been appointed chairman of the Corporation Electricity Committee at South Shields, in succession to the late Ald. J. M. Rennoldson, who had held the position since the electrical undertaking was inaugurated over 20 years ago. The vice-chairman of the Electrical Committee is now Coun. T. R. Dowson, a practical engineer.

Roll of Honour.—For rescuing wounded under fire, Lance-Corporal J. E. T. Wright has been awarded the Military Medal. He was an electrical engineering apprentice with Messrs. Gent & Co., Ltd., Leicester.

Sapper Clarence Lever, R.E., has been killed in action. He was formerly employed as an electrical engineer by the Glasgow Corporation, and was 27 years of age.

Private George Jackson, Lancashire Fusiliers, killed in action, was employed at the Westinghouse Works, Trafford Park.

Private E. P. Pryce, of the K.S.L.I., formerly employed on the Liverpool Corporation tramways, has been awarded the Military Medal for delivering dispatches under great danger.

Sergt.-Major E. C. Woodruff, D.C.M., Canadian Mounted Infantry, who was formerly on the staff of Messrs. Crompton and Co., Ltd., Chelmsford, was killed in action on December 20th. He was some time ago awarded the D.C.M., and had been recommended for a commission.

Private W. Waite, Royal Scots, who has died of wounds, was on the staff of Messrs. W. Caverhill & Co., electrical engineers, Berwick-on-Tweed.

The Military Medal for gallantry in the field has been awarded to Sergeant W. E. Rickard, R.A.M.C., who was on the staff of the India-rubber, Gutta-percha & Telegraph Works Co., Ltd., of Silvertown.

Our South African correspondent says that early in December news reached Johannesburg of the death in action of Lieutenant T. F. Whimster, of the Royal Engineers. Lieutenant Whimster was formerly chief of the Victoria Falls & Transvaal Power Co.'s testing department, which position he had held since 1910. He came to Europe about 18 months ago, and after some 12 months' training went over to France on August 7th. His death is genuinely lamented by all who knew him, and particularly by the V.F.P. staff, who speak of him most highly. Lieutenant Whimster's duties have been carried out by Mr. Monk. The death is also reported from wounds received in action, somewhere in France, of Mr. W. O. Smyth, late of Brakpan Power Station, V.F.P. Co.

Our correspondent adds:—"Prof. J. H. Dobson, the general manager of the Johannesburg Municipal Electricity and Tramways Department, who was appointed Major Commanding the S.A. Pioneer Corps in German East Africa, has not had long to wait for Imperial recognition. Congratulations are due to him on the honour just bestowed on him—D.S.O. for services rendered in German East Africa. Major Dobson has been employed on railway work chiefly, and has shown undoubted resource and energy under circumstances at once trying and unusual. His work must of necessity have been out of the ordinary, as it is barely six months since he left Johannesburg, and the fact that he was without previous military experience makes this honour all the more remarkable."

The *Times* reports that Lieutenant C. T. Bowring, Canadian Machine Gun Company, who has been killed, aged 35, took his electrical engineering degree at Lausanne University, afterwards going through an apprenticeship course at the Westinghouse Works, at Pittsburg. In 1913 he joined the State Elevator Co., of Winnipeg.

Obituary.—Mr. Arthur James Ireland.—Last week we briefly recorded, with regret, the death of Mr. A. J. Ireland, manager of the supply department and branch offices of the British Thomson-Houston Co., Ltd., of Rugby. Mr. Ireland was born in Northampton 57 years ago. In 1879 he went to America, and subsequently joined the American Brush Co., of Akron, Ohio. He installed a number of "Brush" arc lamps in various parts of the West and in Texas, and as this was in the early days of electric lighting, his experiences in the Western States were not only varied, but often highly exciting. Leaving the Brush Co., he became associated with the Thomson-Houston Co., of Lynn, Massachusetts, and later on was appointed European expert to the Thomson-Houston International Co., who were engaged in carrying out various important contracts for arc lighting plant on the Continent. While acting as their representative at Turin, he was summoned to England, in 1885, to carry out work for Messrs. Laing, Wharton & Down, who had acquired the patent rights of the Thomson-Houston system in the United Kingdom. He was retained permanently on the staff of this company, acting as their chief engineer in connection with the installation of arc-lighting systems at various places, including the installations at the American Exhibition at Earl's Court in 1887, and at the Italian Exhibition in 1888.

Mr. Ireland, as chief engineer, took an active interest in the pioneer installations of Thomson-Houston arc lighting at Taunton, Bath, Bristol, and other centres in the West of England, and had charge of the installation to provide the grounds and buildings of the Military Exhibition at Chelsea with electric light. He also carried out some of the early work at the stations and goods yards of the Midland Railway

Arthur James Ireland.

Co at St. Pancras, Leeds, Bradford, and Derby. In addition to the above he was responsible for some of the early central-station plant put down, such as at Weybridge, Fareham, &c.

In 1890 the contract for lighting the eastern portion of the City of London was awarded to the Laing, Wharton & Down Construction Syndicate, and Mr. Ireland had charge of all this work, including the erection of a temporary generating station at Wool Quay; later on he supervised the erection of the first portion of the equipment of the main power house at Bankside, which was designed to furnish power to the whole of the City of London. He was also responsible for the complete installation of street arc lighting throughout the eastern part of the city, and the extensive system of underground mains laid down in that area, as well as numerous sub-stations which were erected to give a supply to private consumers.

In 1894 the Laing, Wharton & Down Construction Syndicate was turned into the British Thomson-Houston, Ltd., and, while acting as chief engineer for the latter, Mr. Ireland carried out important central-station work in different parts of the kingdom, as well as the electrification of tramways in Dublin and elsewhere.

In 1896 the supply business of the British Thomson-Houston Co., Ltd. (the successor of the previous two companies) became so extensive that Mr. Ireland was given entire charge of this work, becoming later also the manager of the various branch offices of the company. Since then he has continued to control this department of the company's business with uniform success.

Mr. Ireland was widely known and highly respected in electrical and manufacturing circles in the United Kingdom. He was a man of strong character and lovable disposition, and all of those who were associated with him, or had any extensive relations with him, were always struck by his honesty of purpose and great sincerity. He was a type of the best of Englishmen, and had the ability to get the most out of all those who worked under him, while still maintaining the most friendly relations with them. Not only his staff, but everyone who came in contact with him, knew that his word could be absolutely depended upon.

He was buried on December 28th at Barnes New Cemetery, Upper Richmond Road, Sheen. He leaves a widow, son, and daughter.

Mr. M. B. Baird.—We regret to record the death, which occurred at his residence at Glasgow on December 16th, of Mr. Matthew Barr Baird, chairman of Archibald Baird & Son, Ltd., Clyde Steel & Engineering Works, Hamilton.

Mr. D. T. Bostel.—The death took place at Balcombe (Sussex), on December 24th, of Mr. D. T. Bostel, of Messrs. D. T. Bostel & Sons, electrical engineers, of Ebury Street, London, to which business he had devoted 30 years of his

life. Deceased, who was in his 80th year, established the business of Messrs. D. T. Bostel & Sons, of Duke Street, Brighton, where he had served on the Town Council. He later started the London concern, leaving his sons to carry on that at Brighton; they also founded the business of Messrs. Bostel, Bros. (Worthing), Ltd., electrical engineers.

NEW COMPANIES REGISTERED.

Association of British Chemical Manufacturers (the word "Limited" is omitted from the title by licence of the Board of Trade) (145,644).—This company was registered on December 28th, as a company limited by guarantee, and not having a capital divided into shares, with an unlimited number of members, each liable for not more than £25 in the event of winding up, to promote co-operation between British subjects engaged as manufacturers in the chemical or closely allied industries; to place before the Government, and Government officials and others, either in the British Dominions or elsewhere, the views of members of the association and others upon matters affecting the chemical industries; to develop technical organisation; to promote industrial research, industrial efficiency, and the advancement of applied industry, &c. The management is vested in a Council consisting of not less than 16 or more than 20, the first members of which are:—Dr. E. F. Armstrong, D.Sc. (London), F.C.G.I., Joseph Crosfield and Sons, Bank Quay, Warrington; F. H. Carr, F.I.C. (director, Boots' Pure Drug Co., Ltd.), Nottingham, chemical manufacturer; Dr. C. Carpenter, D.Sc., M.I.C.E. (president, Society of Chemical Industry, chairman of South Metropolitan Gas Co.), Old Kent Road, S.E.; Dr. M. O. Foster, F.I.C., D.Sc., F.R.S., British Dyes, Ltd., Huddersfield; J. Gray, F.I.C., managing director, Lever Bros., Ltd., Port Sunlight; C. A. Hill, B.Sc., F.I.C., chairman, British Drug Houses, Ltd., Graham Street, City Road, N.; N. N. Holden, managing director, Hardman & Holden, Ltd., Miles Platting, Manchester; D. L. Howard, Howard & Sons, Ltd., Uphall Works, Ilford, chemical manufacturer; C. P. Merriam, managing director, The British Xylonite Co., Ltd., Hale End, London; The Rt. Hon. Sir Alfred M. Mond, Bart., P.C., M.P., chairman, Mond Nickel Co., Ltd., 39, Victoria Street, Westminster; Max Muspratt, chairman, United Alkali Co., Ltd., 30, James Street, Liverpool; R. G. Perry, chairman, Chance & Hunt, Ltd., Oldbury; Sir William Pearce, M.P., director, Spencer, Chapman & Messel, Ltd., 36, Mark Lane, E.C.; R. D. Pullar, chairman, J. Pullar & Sons, Ltd., Pullar's Dye Works, Perth; A. T. Smith, managing director, Castner-Kellner Alkali Co., Ltd., 257, Royal Liver Building, Liverpool; The Rt. Hon. J. W. Wilson, Albright and Wilson, Ltd., Oldbury, chemical manufacturer; Dr. A. Ree (president, Society of Dyers and Colourists), 15, Mauldeth Road, Withington, Manchester. There are to be "Group" Committees, each consisting of not less than three members, representing:— Group 1: Acids (including acetic and oxalic), carbonic acid, hydrogen, oxygen and gases, alum, chrome, zinc, copper and iron compounds, fertilisers (including superphosphates). Group 2: Alkalis, cyanides, chlorine and compounds, silicate, chlorates, borax, hydrogen, peroxide, magnesia compounds (not medicinal). Group 3: Fats, greases, waxes, resins, glycerine, soap. Group 4: Gelatine, sizes, glue, varnishes, paints, polishes, tanning. Group 5: Distillation of coal, shale, oils, and wood, alcohol, acetone, coal tar, primary products (including ammonia and ammonia products), charcoal, fuel. Group 6: Fine chemicals, analytical, pharmaceutical, photographic, rare earths, synthetic essences and perfumes, alcohol derivatives, ethers. Group 7: Phosphates, manganese, potassium, sodium, barium, calcium, cardimium, &c., lead, arsenic, antimony, tungsten, molybdenum, &c. Group 8: Cellulose products (including paper), celluloid, rubber and substitutes. Group 9: Explosives, and dyes and their intermediaries. Group 10: Glass, porcelain, pottery, refractory materials, lime, cement, chemical-resisting materials. Group 11 (allied industries): Bleachers, dyers, and textile printers. Solicitors: Markby, Stewart & Co., 57, Coleman Street, E.C.

Electrical Stores (Nottingham), Ltd. (145,555).—This company was registered on December 16th, with a capital of £5,000 in £1 shares, to adopt an agreement with J. T. Kemp and H. E. Crammond, and to carry on the business of electrical engineers and contractors, suppliers of electricity, carriers of passengers and goods, manufacturers of and dealers in electric railway and tramway and electric, galvanic, magnetic, and other apparatus, &c. The subscribers (with one share each) are: J. T. Kemp, 19, Highfield Road, West Bridgford, Notts., electrical engineer; H. E. Crammond, 126, Ratcliffe Road, West Bridgford, Notts., electrical engineer. Private company. The number of directors is not to be less than two or more than five; the first are not named. Solicitor: A. Barlow, 1, High Pavement, Nottingham.

New Shipston Lighting Co., Ltd. (145,577).—This company was registered on December 19th, with a capital of £5,000 in £1 shares to take over the business of electricity supply works, &c., carried on at Campden Road, Shipston-on-Stour, Worcs., by the Shipston Electrical Co., Ltd. The subscribers (with one share each) are: W. D. Akers, London House, Shipston-on-Stour, Worcs., draper; J. W. Hence, Shipston-on-Stour, Worcs., butcher; H. Holtom, Shipston-on-Stour, Worcs., bank manager; J. R. King, J.P., Honington Hall, Shipston-on-Stour, Worcs.; C. Stein, Park House, Shipston-on-Stour, Worcs., surgeon; G. Turner, High Street, Shipston-on-Stour, Worcs., jeweller; A. H. Jarrett, Cedar Lodge, Shipston-on-Stour, Worcs., draper. Private company. The number of directors is not to be less than five or more than seven. The first are W. D. Akers, J. W. Hence, H. Holtom, J. R. King, C. Stein, G. Turner, and A. H. Jarrett. Qualification, £50. Solicitor: G. E. B. Rogers, 9, Cross Street, Reading.

T. P. Pollitt & Co., Ltd. (145,566).—This company was registered on December 18th, with a capital of £1,000 in £1 shares, to take over the business of electrical, mechanical, and general engineers, contractors, &c., carried on at Fish Dock Road, Grimsby, as Pollitt & Co. The subscribers (with one share each) are: T. P. Pollitt, Fish Dock Road, Grimsby, electrical contractor; Mrs. M. Pollitt, 205, Hainton Avenue, Grimsby. Private company. The first directors (to number not less than two or more than five) are: T. P. Pollitt and Mrs. M. Pollitt. Registered by Alfred H. Atkins, 27-8, Fetter Lane, E.C. Registered Office: Fish Dock Road, Grimsby.

Trade Attractor Co., Ltd. (145,581).—This company was registered on December 19th, with a capital of £500 in £1 shares, to adopt an agreement with Max Alexander and Herman Tas; to acquire and turn to account any invention relating to the production, treatment, storage, application, distribution, manufacture, and use of metallic substances, filaments, electricity, and of any apparatus therefor; to carry on the business of advertising agents and contractors, billposters, electrical engineers, &c. The subscribers (with one share each) are: Max Alexander, 61, New Oxford Street, W.C., merchant; Miss Violet Elliott-Lawson, 56, Cleveland Square, Hyde Park, W. Private company. The first directors (to number not less that two or more than three) are Max Alexander, Theodore C. Elliott-Lawson, and Miss Violet Elliott-Lawson. Qualification, one share. Remuneration (except managing director), £50 each per annum. Registered by Simmons & Simmons, 74, Cheapside, E.C.

Corona Lampworks (Northern), Ltd. (145,612).—This company was registered on December 22nd, with a capital of £10,000 in £1 shares, to take over the business of electric lamp supply stores or depôt carried on by The Corona Lampworks, Ltd., and by J. Brown, their agent, at 156b, Briggate, Leeds, together with the agency rights, title, and interest in connection with the "Corona" brand of annealed tungsten wire filament lamps. The subscribers (with one share each) are: Miss F. Wilby, 93, Brudenell Road, Leeds; T. G. Wintle, Hazelmere, Ilkley, solicitor. Private company. The first directors are to be appointed by the subscribers. Qualification, £100. Registered office: 156b, Briggate, Leeds.

Shell Bands, Ltd. (145,660).—This company was registered on December 29th, with a capital of £6,000 in £1 shares, to carry on the business of manufacturers of copper tubes, shell driving bands, and similar articles by electrolytic deposition, to deal in the development of metallurgy relating to the electrolytic deposition of metals, and to enter into an agreement with N. Bosanquet, R. S. Dormer, and H. Philipson. The subscribers (each with one share) are: J. G. England, 97, Strathyre Avenue, Norbury, S.W., cashier; N. E. Bowley, 73, Pearson Street, Kingsland, N., solicitor's clerk. Private company. The number of directors is not to be less than two or more than eight; the first are N. Bosanquet and G. Houston-Boswall-Preston, R. S. Dormer, and H. Philipson. Qualification, £1. Remuneration, £500 each per annum (managing director, £15 each per week). Registered office: Electrical Power House, Southwick, Sussex.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Newtons, Ltd. (48,936).—Capital, £40,000 in £10 shares. Return dated October 3rd, 1916. 3,265 shares taken up; £18,650 paid; £14,000 considered as paid. Mortgages and charges: £14,000.

Engineering and Arc Lamps, Ltd.—A memorandum of satisfaction to the extent of £500 on December 9th, 1916, of debentures, dated May 26th, 1911, securing £6,000 has been filed.

Brilliant Arc Lamp & Engineering Co., Ltd.—Assignment of book debts by way of memorandum of deposit dated December 7th, 1916, charged on moneys due or to become due in respect of munitions contract, to secure all moneys due or to become due from company to London and South-Western Bank.

New St. Helens & District Tramways Co., Ltd. (59,426).—Capital, £150,000 in 20,000 pref. and 10,000 ord. shares of £5 each. Return dated November 10th, 1916. 15,980 pref. and 9,000 ord. shares taken up; £125,410 paid, including £510 on 1,020 forfeited shares. Mortgages and charges: Nil.

Chadburn's (Ship) Telegraph Co., Ltd.—Capital, £120,000 in £1 shares (60,000 pref. and 60,000 ord.). Return dated October 10th, 1916 (filed November 1st). All shares taken up; £1 per share called up on 50,000 pref. and 50,000 ord.; £100,000 paid; £20,000 considered as paid on 10,000 pref. and 10,000 ord. Mortgages and charges: Nil.

Pacific & European Telegraph Co., Ltd. (36,683).—Capital, £100,000 in £10 shares. Return dated November 21st, 1916. All shares taken up; £4 per share called up; £40,000 paid. Mortgages and charges: £67,500.

Monte Video Telephone Co., Ltd.—Capital, £160,000 in £1 shares (87,000 pref. and 73,000 ord.). Return dated December 4th, 1916 (filed December 12th). 86,492 pref. and 72,680 ord. shares taken up; £159,172 considered as paid. Mortgages and charges: Nil.

Magnesium Metal Co., Ltd.—Second mortgage debenture, dated December 15th, to secure £10,000, charged on the company's undertaking and property, present and future, including uncalled capital, subject to charge dated February 18th, 1916. Holders: Vickers, Ltd., Vickers House, Broadway, Westminster.

Rhondda Tramways Co., Ltd.—A memorandum of satisfaction to the extent of £4,100 on November 30th, 1916, of charges dated March 24th, 1911, November 13th, 1912, and March 11th, 1915, securing £250,000, has been filed.

CITY NOTES.

Tata Hydro-Electric Power Supply Co., Ltd.

A Bombay newspaper just to hand contains a copy of the report of the directors of this company. It states that the concessions in respect of the development of the Andhra Valley have been transferred to the Andhra Valley Power Supply Co., Ltd., for a sum of rupees five lacs. The company have applied to Government for the grant of a licence which will be transferred to the Andhra Valley Co. The company are also to receive annually a sum of rupees fifty thousands from the Andhra Valley Co., or a sum equivalent to 15 per cent. upon the net profits (after making certain deductions), whichever be the larger sum. The 7 per cent. dividend on preferences shares commenced to run from January 1st, 1916, and the directors recommend out of the balance of Rs. 5,18,866 a dividend in respect of the half-year ended June 30th last on the 7,722 "preference" shares allotted up to June 30th, 1916, at the rate of 7 per cent. per annum after deducting income-tax, and also a dividend in respect of the same period on the 9,349 "ordinary" shares allotted up to June 30th, 1916, at the rate of 5 per cent. per annum. The total amount so payable for dividends will come to Rs. 5,00,653, leaving a balance in hand amounting to Rs. 18,213 to be carried forward to next account.

"During the last season the Shirawta Dam reached a height sufficient for storage at 2097 level, or 13 ft. above the draw-off level. Towards the close of the rains an additional foot of storage was obtained by raising the escape. The work was recommenced on this dam on September 16th, and satisfactory progress has been made.

"The tunnel between Walwhan and Shirawta is completed except for trimming up work; a quantity of excavation remains in widening the approach cut, which will be put in hand when Shirawta Lake is emptied. The excavation for the tunnel head-works is nearly finished, but no masonry is yet commenced. The Walwhan Dam, Lonawla Dam, Duct, and Forebay are all practically completed, and the pipe-line is completed for one upper pipe-line and five small lower pipe lines. The whole of the works on contract No. 1, comprising

all the above items except Shirawta Dam and tunnel headworks, are practically complete, only finishing-up work remaining to be done. The construction of the four units of the first installation of the power house with all accessories was completed during the year, and all of such plant put into regular revenue-earning service. The difficulty at first experienced with the generators has been overcome, and operation generally may now be considered as satisfactory. The fifth unit, with its equipment, will soon be ready for beneficial operation. The work of improving the insulation of the transmission lines has been continued throughout the year, and will shortly be completed. All apparatus has been in regular service at the receiving station and given uniform satisfaction. Two more synchronous condensers for improving the power factor in the system are on order. The underground cables have been in full and regular service, and no trouble has been experienced with them.

"Thirty-four mills are now receiving a supply of electrical energy, and we believe we are justified in saying that the service is a generally satisfactory one. All mills, with whom we had contracted for the supply of power from the first installation, are receiving their energy from our system, with the exception of about 3,000 H.P., which the consumers have so far been unable to avail themselves of on account of the difficulty in obtaining their own machinery. This power is now gradually being taken up. There is now a total of 49,910 B.H.P. of motors in service, returning a monthly revenue of approximately Rs. 2,22,000."

British Columbia Electric Railway Co., Ltd.

Mr. HORNE PAYNE, the chairman, was unable to be present at the recent annual meeting, but his speech was read by Mr. H. G. BROWN. He said that it was impossible to issue the accounts earlier as the secretary was the sole male employé of the company left in London. The total gross income for the year was only £258,000, as compared with £370,000 in the preceding year and £560,000 in the year before that—a decrease in two years of considerably more than 50 per cent. This was due to a reduction of 30 per cent. in the population of their districts due to the war, and to the continuance of the unfair competition of the jitney cars. It was reasonable to look for an increase in profits on the return of the troops—almost as rapid as the decrease had been. He did not mean to say that they would get back all at once to the dividend formerly received on the deferred ordinary stock, but he thought they would again receive a moderate return on the money invested in that stock within a year or two of the end of the war. The company had deserved well of the people of British Columbia, but in the matter of the jitney car competition they had not received it. They had not yet been able to convince the authorities and the public of the folly of maintaining by preferential treatment, to the detriment of a great enterprise, a service which was merely a convenience to a certain section of the public, and could do nothing to advance permanently the general welfare, by the expenditure of capital, the employment of labour, or the encouragement of industries. They were now called upon to face a large increase in the cost of labour. There had been for some time past a great deal of trouble in connection with labour throughout the American continent, and British Columbia had not escaped. The shortage of men and the increase in prices of commodities created a difficult situation. These conditions seriously affected the company's employés, and although the agreement with them still had a few months to run, it was recently decided to grant an immediate increase of wages. This involved an increase of considerably more than $100,000 per annum in working expenses, and it was to remain in force until June, 1918. An improvement in net earnings commenced in February, and had continued down to the date of the last return received (October). There were grounds to hope that that increase in earnings might continue on a sufficiently large scale to enable them this year to meet the dividend on the 5 per cent. cumulative preference stock without having recourse to the reserve fund, and with perhaps a small surplus. In estimating the prospects of the company, one had largely to be guided by the general outlook in British Columbia. From its geographical position, British Columbia had experienced a more severe set-back from the war and less benefit from war trade than any other province of Canada, the mining industry alone having derived substantial benefit, while such important industries as the shipping trade and the lumber trade had been practically paralysed. There could be no doubt, however, that during the last six months these trades and commercial and industrial conditions generally had been steadily improving. Much attention was being given to the development of the mining industry, and the mines had experienced a great demand for their products for munition purposes. The Provincial Government were assisting the development of the shipbuilding industry, and there seemed no reason why Vancouver and Victoria should not successfully rival Seattle and San Francisco in shipbuilding. There was an increasing export trade with Russia and the East, particularly in munitions, railway materials, &c., and it was believed that after the war the exchange of commodities with Russia across the Pacific would be permanently established. He thought that undoubtedly the worst times were experienced towards the end of last year, and that from now on they would see continued improvement.

Cordoba Light, Power and Traction Co., Ltd.

Mr. G. A. TOUCHE, M.P., presiding at the recent annual meeting, said it was the irony of fate that in a year when, owing to shipping difficulties the price of fuel was disastrous, they should experience such a drought as had never been known in the history of the company. In the 21 years for which they had the official records the rainfall for the six months corresponding to the second half of the financial year had never been anything like as low as it was this year. In ordinary circumstances they used their reserve steam station only as a standby in case of emergencies. This year they had had to generate a large proportion of the electrical energy supplied to the tramways and to their customers, both public and private, by means of steam. The effect upon the accounts would be appreciated when he told them that, in the six months to September 30th last, the operation of their steam station cost practically £23,000, against £540 in the corresponding six months of the previous year. Of this £23,000, no less than £20,400 was the cost of fuel alone. Notwithstanding the bad times in South America, the gross receipts of the combined businesses were not only maintained but increased. They amounted to £162,460, and constituted a record, comparing with £157,590 in 1915, and £160,420 in 1914, up till that date their highest figure. The tragedy came in the expenses, which were £100,539, against £74,270 in 1915, an increase of £26,269. The net receipts were £61,921, compared with £85,320, a decline of £21,399. Taking the Light & Power Co. by itself, the gross receipts were £90,577, against £88,550 in 1915, an increase of £2,027. The expenses were £55,633, in comparison with £30,906 in 1915, an increase of £24,727. The net receipts were £34,944, against £57,644, or a decline of £22,700. The number of customers for light and power on the books at the end of September last showed an increase of 7.38 per cent. over the number at September 30th, 1915. The number of lamps connected was greater by nearly 6 per cent. The number of units of current sold was almost identical with the number sold in the previous year, but the income per unit was nearly 2¼ per cent. greater. On the other hand, on account of the steam operation, the cost per unit sold was nearly 81 per cent. more. Practically no change had taken place in regard to their relations with the competing company, but they expected to see the chairman of that company here in London at an early date. The records of the Tramways Co. during the year did not show any great progress; nevertheless, it had not gone back. The gross receipts were £71,883, against £69,040 in 1915 (an increase of £2,843). The expenses increased, being £44,906, compared with £43,360, but the ratio of expenses to gross receipts was slightly less at 62.47 per cent., against 62.8 per cent. in the year to September 30th, 1915. The net receipts were £26,977, against £25,680 (an increase of £1,297). The revenue brought into the accounts of the holding company was £62,383, compared with £78,451 last year. But for the additional abnormal operating expense of the lighting and power business there should have been a profit of about £23,000, or £5,000 more than sufficed to pay the dividend on the preference shares for the year in full. As it was, there was a small loss of £230, after meeting all fixed charges, including debenture stock interest and sinking fund and interest on the promissory notes. In the circumstances they had no alternative but to defer the payment of the preference dividend. The outlook with regard to the fuel situation was still too serious to enable them with any prudence to distribute the accumulations at the credit of profit and loss. It was a matter of some congratulation that they were able to pay, out of the year's earnings, the interest charges on practically a million pounds of loan capital.

The Siemens-Schuckert Group.

The Nuremberg Co.—The accounts of the Elektrizitats A.G. vorm. Schuckert and Co., of Nuremberg, for the year ended on July 31st, 1916, indicate gross profits of £516,000 and balance forward of £76,000, as compared with £436,000 and £66,000 respectively in 1914-15. The general expenses, interest charges, taxes, and customary depreciation absorb £184,000, as against £182,000, and the coupon tax reserve fund £5,000, as in the previous year, leaving net profits amounting to £403,000, as contrasted with £315,000. It is proposed to transfer £26,000 to the provident fund, to apportion £17,000, as against £11,000, as the profit share of the directors, managers, and officials, and to pay a dividend of 8 per cent. on the share capital of £3,500,000, this contrasting with 6¼ per cent. in 1914-15, 6½ per cent. in 1913-14, and 8 per cent. in 1912-13.

The Rhenish Schuckert Co.—The report of the Rheinische Schuckert Ges. fur Elektrische Industrie, of Mannheim, which deals with the year ended on July 31st, 1916, states that the unfavourable conditions brought about by the war continued during the year. Constructional activity remained restricted, but a greater amount of installation work was carried out in connection with the company's electricity supply undertakings. The sale of energy increased owing to the growth in the number of connections, although the private consumption, especially in the country, left something to be desired. No changes took place in the number of the company's own supply works, which experienced further satisfactory development, notwithstanding the difficult conditions; the extensions of these works were kept within moderate limits, and comprised chiefly the connection of new consumers. The accounts

show net profits amounting to £45,500, as compared with £45,100 in 1914-15, and the dividend is at the rate of 5 per cent. on the ordinary share capital of £550,000, this comparing with the same rate in 1914-15 and 1913-14, and 8 per cent. in 1912-13.

Siemens & Halske.—The directors of Siemens & Halske, A.G., of Berlin, state that the total production in 1915-16 was not less than that which prevailed in the previous year, although displacements took place in various departments in consequence of activity for the requirements of the Army and Navy, whilst the financial results also were approximately the same as in 1914-15. The net profits are stated to amount to £625,000, as compared with £626,000, and after the allocation of £75,000 to the "Siemensstadt" war welfare foundation, as against £150,000 in 1914-15, it is proposed to pay a dividend of 12 per cent., being the same rate as in 1914-15, and comparing with 10 per cent. in 1913-14, and 12 per cent. in 1912-13, on an ordinary share capital of £3,150,000. Including the provision made by the Siemens-Schuckert Works, the capital of this foundation has now reached a total of £500,000. The payment of the dividend absorbs £378,000; the sum of £100,000 has been placed to the special reserve fund, as in 1914-15, and £45,000 has been appropriated for bonuses to the staff. The Siemens family has created, with a capital of £50,000, a foundation for the promotion of dwellings for officials and workmen in connection with the centenary of the birth of Werner von Siemens. The directors of Siemens & Halske have decided, in conjunction with those of the Siemens-Schuckert Works, that each company shall make a contribution of £50,000 towards this foundation, which consequently begins with a capital of £150,000.

Siemens-Schuckert.—The financial statement of the Siemens-Schuckert Werke G.m.b.H., of Berlin, remarks that it was not possible fully to satisfy the demand for electrical manufactures, as the production and improvement of substitutes for electrical conductors and their insulation, in which the company participated largely, occupied a considerable time. It was necessary to accommodate the methods of manufacture to the new material, and to test the latter in working. The exports to transmarine countries ceased entirely owing to the English blockade. The company's workshops were naturally occupied to a large extent on the manufacture of articles of war for the Army and Navy. The increased demand of all industries, particularly the chemical industry and the heavy industry (iron and steel and engineering) caused the most strenuous activity to prevail in the department for electric motive power. Concerning the company's finances, the statement observes that the liquid funds have considerably increased, and that these will, of course, be largely required in the change over of the departments to the production of peace manufactures. As gross profits, the accounts show the sum of £1,275,000 for 1915-16, as contrasted with £1,399,000 in the previous year. After defraying general expenses, interest on loans, and depreciation of buildings, the net profits are returned at £765,000, as against £888,000 in 1914-15. It is intended to divide 10 per cent. between the two proprietary companies, as compared with 10 per cent. in 1914-15, 7½ per cent. in 1913-14, and 10 per cent. in 1912-13. The sum of £125,000 has been transferred to the reserve fund, as in the preceding year; £75,000 has been allocated as bonuses to staff and workmen, as in 1914-15; £25,000 has been placed to the contingency fund, and £75,000 has been allotted to the Siemensstadt war welfare foundation, as compared with £200,000 in 1914-15.

Marconi's Wireless Telegraph Co., Ltd.—The directors report with regret that they have not yet been able to obtain from Government Departments a basis of settlement in respect of either remuneration or compensation for services rendered, for the use of their stations since the commencement of the war, nor in respect of other matters in which the Government is indebted to the company. In these circumstances the declaration of a bonus, to which reference was made at the general meeting, must still remain in abeyance. However, without taking into account the considerable sums which are estimated to be due to the company in respect of the matters referred to above, the business which has been actually completed for the current year has been satisfactory, and the directors, without departing from the policy, which was approved at the last general meeting, of husbanding their resources, feel justified in declaring the 7 per cent. preferential dividend upon the cumulative participating preference shares, and an interim dividend of 5 per cent. on the ordinary shares, both less income-tax.

Holme (Huddersfield) Electricity Co.—The annual meeting was held recently. It was reported that the scheme of utilising a local stream for power generation was proving a success, and was being watched with interest by neighbouring authorities. The balance sheet showed a profit for the first year's work of £32, after allowing £76 (10 per cent.) for depreciation. A dividend of 3 per cent. was declared, and £25 carried forward. The chairman expressed indebtedness to shareholders and voluntary workers, and said the company would probably be out of debt in eight years.

Marconi International Marine Communication Co., Ltd.—The directors announce an interim dividend of 5 per cent., equal to 1s. per share, less income-tax, on account of the current year.

Humphrey Pump Co., Ltd.—The report for the year ended September 30th last states (says the *Financial Times*) that the conditions produced by the war have continued to seriously prejudice the business of the company. Substantial progress has been made in the development of the new type of small pumps, and the directors are pleased to state that a number of orders has been secured, including contracts. Work is proceeding as rapidly as circumstances will permit, and, in order to facilitate as much as possible the output of pumps, machine tools are being put down at the company's test station at Dudley Port. There is a deficiency on the year of £4,728, making the total debit balance £26,375.

Stock Exchange Notice.—The undermentioned are to be quoted in the Official List:—

Consolidated Gas, Electric Light & Power Co. of Baltimore. —$619,000 additional common stock.

Lima Light, Power & Tramways Co.—A dividend of 1 per cent is announced.

STOCKS AND SHARES.

Tuesday Evening.

Coming back to work after the New Year's Day holiday, the Stock Exchange markets started to prepare decks for an immediate issue of the long-expected War Loan. The withdrawal of the 6 per cent. Exchequer Bonds and War Expenditure Certificates was the obvious forerunner of the new loan. A hum of anticipation pervaded the Consol market. Brokers set their staffs addressing foolscap envelopes by the thousand. Speculators bought 4½ per cent. War Loan in blocks.

It is hoped that the disturbance in other investment markets created by the 4½ per cent. War Loan in June/July, 1915, may be avoided this time. Debenture stocks, particularly in the industrial sections, lost anything from 4 to 10 points. Preference stocks and shares gave way in proportion. The shrinkage came gradually. Much of it was imperceptible until a holder happened to want to realise his stock, when he found that the usual purchasers were prepared to deal only on the basis of the new standard set up by the 4½ per cent. loan. Rumour will probably be set at rest before these notes come out as to the price at which the new loan will be offered to the public; and if the advance guesses are anything to go by, the investor will be generously treated. That this will react upon existing securities is no doubt inevitable; but perhaps it is a little early yet to attempt any forecast as to what the actual influence of the loan will be.

Business has been extremely active in the Consol market, upon which attention has naturally focused at the moment. Home Railway stocks are generally better. There is a little buying going on, and, rather curiously, it is the low-priced stocks of the speculative nature which are being sought more particularly. Districts dipped to 15¼, but rallied to 16¼. Underground Electric ordinary shares improved to 2 3/16; the company's 6 per cent. income debentures are ¼ up at 93.

The issue of the 4½ per cent. War Loan had the immediate effect of causing markets round the Stock Exchange to be reduced as a whole to something approaching stagnation during the time through which the lists were open; and if the newcomer is offered on the extremely favourable terms rumoured in the City to-night, no one would feel surprised if a somewhat similar state of affairs were to prevail for a month or six weeks.

Electric Lighting shares are quiet. South Londons rose ¼ to 2¾, but County of London preference shares at 9¾ have lost the small fraction which they secured last week. Curiosity is agog as to how the dividends will come out. The West End companies, it may be remembered, fared less successfully in the corresponding period than did those working in the City; and prophets are disposed to think that the electric lighting market may see a repetition of this tendency in respect of the half-year which has just ended.

Amongst telegraphs and telephones, there is a demand for the two stocks of the Anglo-American Telegraph Co., and the prices of both are better. The Western Telegraph Co. is making an offer of 25s. per share for the shares of the West Coast of America Co., and this is the middle price of the quotations furnished by the market. West Coast of America shares were formerly of the nominal value of £10, but were written down to £2 10s., so that the present offer is 50 per cent. of their par price.

The last time that the company paid any dividend was in May, 1913, when 1s. per share was distributed in respect of 1912; as there seems to be little prospect of further distribution for some years to come, the assumption is that shareholders will accept the offer which is being made to them by the Western Telegraph Co. The latter guarantees the £150,000 4 per cent. debentures of the West Coast of America Telegraph Co., and is about to pay off this obligation. The West Coast concern has an issued capital of 30,008 shares, out of an authorised 53,008; and we understand that

a large proportion of these is already held by the Western Telegraph Co.

Marconi shares are unaffected by the declaration of an interim dividend of 5 per cent. for 1916, the same rate as that paid for the previous twelvemonth. The company has not yet settled with the Government as to the payment which is to be made for the use of the Marconi stations since the outbreak of war, and the directors, therefore, will not declare any bonus. The price of Canadian Marconis keeps about 9s. 6d., and that for Americans is 16s. 6d.

Brazilian Tractions have further spurted to 52, making a rise of 5½ points since the middle of December. Other Brazilian things are also in favour. There is a disposition, too, for speculative buyers to pick up Mexican stocks, though so far this has not extended to the issues of the utility companies. British Columbia Electric deferred regained 2 points after its severe fall, the market in the stocks being better as a whole, although the effects of the shock administered by the recent report have not yet worn off. Other foreign tramway issues are generally steady.

The principal feature in the list of manufacturing companies, so far as prices are concerned, is a drop of 1s. 6d. in British Aluminium ordinary. Shares have been offered with a certain amount of freedom by country holders. Castner-Kellners eased off to 3½. Many ex-dividend markings occurred this week, some of them extending to stocks and shares concerned in the electrical industries; apart from these, however, the movements are mostly insignificant. The price of rubber improved to 3s. per lb., and the first business day of the new year produced a fair crop of buying orders, the bulk of which also came from the provinces. The copper group generally remains heavy, and the same remark applies to that for iron, coal, and steel shares.

SHARE LIST OF ELECTRICAL COMPANIES.

	Dividend 1914.	Dividend 1915.	Price Jan. 2, 1917.	Rise or fall this week.	Yield p.c.
HOME ELECTRICITY COMPANIES.					
Brompton Ordinary	10	10	6⅜	—	£7 11 0
Charing Cross Ordinary	5	5	8⅜	—	7 8 2
do. do. do. 4½ Pref.	4½	4½	5 7/16	—	6 11 0
Chelsea	5	4	3	—	6 18 4
City of London	9	8	11⅜	—	7 0 8
do. do. 6 per cent. Pref.	6	6	10	—	6 0 0
County of London	7	7	10½	—	6 18 3
do. 6 per cent. Pref.	6	6	9⅞	+ ⅛	6 1 6
Kensington Ordinary	9	7	5⅝	—	6 4 5
London Electric	4	3	1⅜	—	6 10 5
do. do. 6 per cent. Pref.	6	6	4 7/16	—	6 15 4
Metropolitan	3½	3	2¼	—	6 13 4
do. 4½ per cent. Pref.	4½	4½	8¼xd	—	7 4 0
St. James' and Pall Mall	10	8	6	—	3 13 4
South London	5	5	2⅞	+ ⅛	6 19 0
South Metropolitan Pref.	7	7	1 7/8	—	6 7 3
Westminster Ordinary	9	7	5⅜	—	6 4 5
TELEGRAPHS AND TELEPHONES.					
Anglo-Am. Tel. Pref.	6	6	96	+ ½	6 5 0
do. Def.	30/-	33/6	22⅝	+ ½	7 8 0
Chile Telephone	8	8	7⅝	—	5 12 3
Cuba Sub. Ord.	5	5	8½	—	6 3 6
Eastern Extension	7	8	14	—	*5 14 4
Eastern Tel. Ord.	7	8	140½	—	*5 14 0
Globe Tel. and T. Ord.	6	7	12½	—	*5 12 0
do. Pref.	6	6	10	—	5 18 5
Great Northern Tel.	22	22	36xd	—	6 2 3
Indo-European	13	13	49½	—	6 11 4
Marconi	10	10	2¾	—	3 9 5
New York Tel. 4½	4½	4½	101	—	4 9 0
Oriental Telephone Ord.	10	10	2.5	—	4 6 6
United R. Plate Tel.	8	8	6 1/16	—	*5 19 8
West India and Pan.	1	6d.	1	—	2 4 0
Western Telegraph	7	8	13	—	*5 15 4
HOME RAILS.					
Central London, Ord. Assented	4	4	65½	—	6 2 2
Metropolitan	1½	1	25	—	4 0 0
do. District	Nil	Nil	15½	—	Nil
Underground Electric Ordinary	Nil	Nil	2 3/16	+ 1/16	Nil
do. do. "A"	Nil	Nil	6/6	—	Nil
do. do. Income	6	6	93	—	*6 9 0
FOREIGN TRAMS, &c.					
Adelaide Sup. 6 per cent. Pref.	6	6	4⅛	—	6 1 6
Anglo-Arg. Trams, First Pref.	5½	5½	3	—	9 3 4
do. 2nd Pref.	5½	5½	3⅜	—	—
do. 5 Deb.	5	5	62½	—	8 0 0
Brazil Tractions	4	4	5⅛	+⅜	7 13 10
Bombay Electric Pref.	6	6	10½	—	5 17 3
British Columbia Elec. Rly. Pfce.	5	5	62½	—	8 0 0
do. do. Preferred	—	Nil	40½	—	Nil
do. do. Deferred	—	Nil	37½	—	Nil
do. do. Deb.	4½	4½	63	—	6 17 4
Mexico Trams 5 per cent. Bonds	—	Nil	32½	—	Nil
do. 6 per cent. Bonds	—	Nil	27½	—	Nil
Mexican Light Common	Nil	Nil	7⅝	—⅝	Nil
do. Pref.	Nil	Nil	15½	—2	Nil
do. 1st Bonds	Nil	Nil	97½	+⅝	—
MANUFACTURING COMPANIES.					
Babcock & Wilcox	14	15	2 1/32	—	5 6 9
British Aluminium Ord.	5	7	28 6	—1/6	5 12 3
British Insulated Ord.	15	17½	11½	—	7 6 10
British Westinghouse Pref.	7½	7½	9⅜	—	6 6 4
Callenders	15	20	13	—	7 13 10
do. 5 Pref.	5	5	4½	—	5 17 8
Castner-Kellner	20	22	8½	+ 1/16	6 5 7
Edison & Swan, £8 paid	Nil	—	1/16	—	Nil
do. do. fully paid	Nil	—	1⅛	—	Nil
do. do. 4 per cent. Deb.	5	5	61½xd	—	8 2 8
Electric Construction	6	7½	1 7/8	—	7 1 2
Gen. Elec. Pref.	6	6	9½xd	—	6 3 1
do. Ord.	10	10	13½	—	7 5 6
Henley	20	25	16	— ½	7 13 10
do. 4½ Pref.	4½	4½	4	—	5 12 6
India-Rubber	10	10	12⅝xd	—	*7 17 0
Telegraph Con.	20	20	38	—	*6 5 0

* Dividends paid free of income-tax.

MARKET QUOTATIONS.

IT should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general, and they may vary according to quantities and other circumstances.

Wednesday, January 3rd.

CHEMICALS, &c.		Latest Price.	Fortnight's Inc. or Dec.
a Acid, Oxalic	per lb.	1/6	1d. dec.
a Ammoniac Sal	per ton	£75	..
a Ammonia, Muriate (large crystal)	,,	£54	..
a Bisulphide of Carbon	,,	£23	..
a Borax	,,	£34	..
a Copper Sulphate	,,	£66	£9 inc.
a Potash, Chlorate	per lb.	2/6	..
a ,, Perchlorate	,,	2/-	..
a Shellac	per cwt.	142/-	..
a Sulphate of Magnesia	per ton	£16	..
a Sulphur, Sublimed Flowers	,,	£19	..
a ,, Lump	,,	£16	..
a Soda, Chlorate	per lb.	1/-	..
a ,, Crystals	per ton	120/-	..
a Sodium Bichromate, casks	per lb.	..	..
METALS, &c.			
c Brass (rolled metal 2' to 12' basis)	per lb.	..	..
c ,, Tubes (solid drawn)	,,	..	..
c ,, Wire, basis	,,	..	..
c Copper Tubes (solid drawn)	,,	1/8½ to 1/9	1½d. dec.
g ,, Bars (best selected)	per ton	£175	£10 dec.
g ,, Sheet	,,	£175	£10 dec.
g ,, Rod	,,	£175	£10 dec.
d ,, (Electrolytic) Bars	,,	..	..
d ,, ,, Sheets	,,	..	..
d ,, ,, Rods	,,	..	..
d ,, ,, H.C. Wire	per lb.	..	..
f Ebonite Rod	,,	3/-	..
f ,, Sheet	,,	2/6	..
n German Silver Wire	,,	2/3	..
h Gutta-percha, fine	,,	6/10	..
h India-rubber, Para fine	,,	3/3	½d. dec.
i Iron Pig (Cleveland warrants)	per ton	Nom.	..
l ,, Wire, galv. No. 8, P.O. qual.	,,	£36	..
g Lead, English Pig	,,	£33 5	..
g Mercury	per bot.	£18 15	..
e Mica (in original cases) small	per lb.	6d. to 8/-	..
e ,, ,, ,, medium	,,	8/6 to 6/-	..
e ,, ,, ,, large	,,	7/6 to 14/- & up.	..
d Silicium Bronze Wire	per lb.	1/11	..
r Steel, Magnet, in bars	per ton	..	..
g Tin, Block (English)	,,	..	..
n ,, Wire, Nos. 1 to 16	per lb.	2/11	..

Quotations supplied by—

a G. Boor & Co.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons
r W. F. Dennis & Co.

"America's Electrical Week." — From information supplied to us by the Society for Electrical Development, it appears that the results of the "Electrical Week" surpassed those of the "Electrical Prosperity Week" of last year. The flood-lighting of the statue of Liberty opened the week with spectacular effect, and gained universal publicity, but, as a rule, the celebration was more of an educational character than in 1915. Some of the methods adopted for exciting public interest were very striking, and expense appears to have been a minor consideration. At Portland, O., a great Christmas tree, 100 ft. high, "blossomed into a jewelled fire of incandescence" on the opening night of the week, while electrical genii ran up and down the streets turning on festoons of lights which illuminated the city's shopping sections. Search lights played in varied colours on steam curtains sent up from the North-Western Building. At Chicago, Ill., many of the city's noted electrical engineers and merchants addressed crowds in the High Schools; the lectures were illustrated, and treated of various topics of electrical interest.

Coloured slides appeared all the week in 750 Chicago motion picture theatres. One thousand delivery wagons carried muslin signs. Every department store and dealer displayed the "Aladdin" poster, and 4,500 cars on the surface lines carried the design. The Commonwealth Edison Co. distributed $1,000 in prizes for essays to Chicago High School students on "The Comforts and Conveniences of Electricity in the Home." Contractors were awarded cash prizes for the highest total of contracts for wiring old and new residences under a co-operative plan.

At 46 towns electrical exhibitions were held, and hundreds of thousands of booklets and other advertising matter were distributed by post. At Pueblo, Colo., the Arkansas Valley Railway, Light and Power Co. held an electrical show; novel indoor and outdoor features advertised the show, one of the street features being a "talking lamp-post" connected with a phonograph in the company's office, by means of which selections from grand opera, political speeches, and lectures on electricity were heard by crowds in the street. Certainly it was some week. A special article in *Leslie's Illustrated Weekly*, which claims to be read in 420,000 homes, admirably set forth the advantages of electricity in housekeeping, with the aid of eloquent illustrations, and the Press generally supported the campaign with enthusiasm.

SMALL ELECTRIC MOTORS.

BY "BOOSTER."

THE use of small electric motors might, in the opinion of the writer, be much more general if greater endeavours were made to demonstrate to householders, shopkeepers, and others the advantages they offer in connection with the operation of small machines. There are, for instance, numerous hairdressers who still adhere to a manually-operated wheel for working their machine brushes, whilst it is not uncommon to find gas engines and other primitive forms of motive power employed for grinding coffee in large grocers' shops. The uses to which small electric motors may be put in the home and in various businesses are innumerable, and these motors provide a highly desirable, convenient, and economical method of performing many operations ordinarily done by hand. For driving sewing machines, washing machines and wringers, coffee grinders, meat choppers, vacuum cleaners, and other household appliances, there is still an immense field for the electric motor. What is wanted to accelerate this branch of the industry is more vigorous propaganda on the part of central station authorities. Motor manufacturers particularly American manufacturers, have developed a large variety of sizes and types of small motors to meet the requirements of various devices and machines, and the varying frequencies and voltages met with on ordinary commercial circuits. Thoroughly reliable motors can be obtained for all outputs and all ordinary voltages down to about $\frac{1}{30}$ H.P., and, so far as the writer can see, there is no very logical reason while these small motors should not be employed more extensively in business establishments and in the home.

In the middle-class and wealthy residential areas every endeavour ought to be made to encourage the use of electric motive power; for although fractional horse-power motors consume little current, they will, if connected to electric lighting mains in large numbers, materially increase the day loads.

The difficulties involved in applying small motors to household appliances are not, as a rule, very formidable, although certain points must be observed. In some cases, for instance, the absence of noise is of vital importance, and if proper precautions are not taken in this direction small motor applications are apt to fail lamentably. The writer experienced, some time back, considerable trouble with a small motor, owing to excessive noise which emanated from the gearing between the motor and the driven machine, and it would appear that if quiet running is essential, as, for instance, when motors are used for driving talking machines and musical instruments, gearing in the form of ordinary spur wheels should be avoided. As an alternative to such gearing a belt, chain, or friction drive may be used; but, of course, where speed reduction is unnecessary, the motor may be directly coupled to the driven machine, preferably through a flexible coupling. Worm gear may also often be used with advantage, especially where the required speed reduction is large. The advantage of the friction drive, which has been applied with success to moving picture machines, is that it allows of speed variation without altering the speed of the motor, whilst the advantages of a chain drive over a belt are that the drive in the latter case is positive, and large speed reductions can be obtained with a comparatively short distance between the driving sprockets. Hence the method of driving is determined, not only by the question of noise, but also by the amount of space available, the general character of the machine to be driven and the ratio of the reduction desired. As many small motor-driven machines are connected to the circuit only for short intervals, and are idle the greater part of the time, it may be possible to use a very small intermittently rated motor, but it is far better, if immunity from breakdown is desired, to employ a motor that will work the machine continuously at full load, for it is to be remembered that in private houses and business establishments motors will, as a rule, be left to the mercy of people who are not electricians in any sense of the word, and machines are apt to be left running for indefinite periods.

On direct-current circuits a simple shunt motor will in many cases serve quite well, although, of course, when the required starting torque is excessive, use may have to be made of a compound motor. Co-operation between the makers of household appliances and manufacturing electrical firms would, it seems, be beneficial. The makers of coffee-grinders and roasters, meat-choppers, washing and wringing machines, and other machines and appliances of a kindred nature might be approached with advantage, with a view to getting them to adapt their machines to the electric drive, for it is owing in no small measure to the co-operation of machine tool makers and electrical manufacturers that electric driving has, of late years, made such excellent progress in engineering workshops. If household appliances were turned out complete with electric motors in the same way as machine tools and certain other contrivances, the effect would, in all probability, be beneficial to central station engineers and everyone concerned. In America a great deal more has been done in this direction than has been done here. Motors are combined with all kinds of household machines and appliances, with the result that all that has to be done when they are delivered, is to connect them up to the supply circuit. A machine that is designed to be worked by electricity is, as a rule, infinitely better than one that is fitted with a motor as an after thought. Such machines are usually very compact, for the motor is placed in the best possible position, and owing to the accumulated experience of the firms that supply the motors, trouble is unlikely to arise. Just as an engineer who is in the habit of electrifying factories can determine with little trouble what type and size of motor is required to drive a given machine, so can those who are accustomed to household appliances easily pick out a motor that will, under given conditions, perform the work in the best possible manner.

As regards the special features that small motors should possess, lightness is not infrequently a matter not to be ignored, for many small motor-driven machines are of a portable or semi-portable character. Maximum output with minimum space is another desirable feature.

On single-phase alternating-current circuits two distinct types of motors may be used—the so-called split-phase induction motor and the series-commutator motor with laminated poles. On an alternating-current circuit an ordinary shunt motor will not, of course, work. The series motor develops a good starting torque, and is used very largely for working small electric tools, fans, and vacuum cleaners. The early split-phase induction motors developed a very poor starting torque, and not infrequently a clutch was fitted which allowed the rotor to run idle until a predetermined speed had been reached. In this direction, however, considerable improvements have of late years been made, and motors are now built by American manufacturers that are said to exert at starting a torque equal to the full load torque. Motors with clutches are, however, still occasionally used. The advantage is, of course, that the machine develops a maximum starting torque with a minimum starting current. Motors of the induction type are very sensitive to variations in the supply pressure, since the torque varies approximately as the square of the applied pressure. It is, therefore, advisable when purchasing small induction motors to be connected to ordinary lighting circuits to select a machine that will develop the maximum torque likely to be required with a reduction in the voltage of 10 or 15 per cent.

Perhaps the most useful service to which small electric motors can be put is that of driving small tools—such as drills, grinders, polishing buffs, and so forth; and for this class of service a series motor is, as already indicated, usually employed. Although the electric tool industry has made remarkable headway within recent years, these tools have not as yet by any means entirely displaced small tools, such as drills, &c., worked with compressed air. Of course, in the early days, small electric tools were rather troublesome, especially those made abroad, and the bad reputation they gained is not to be wondered at. For a long time past, however, excellent portable electric tools have been made in this country, and they are now used in many engineering factories and shipyards. There are, however, many works in which compressed air remains in vogue, and

the electrical tool industry has undoubtedly still to be developed. With modern portable electric tools most electrical engineers are now quite familiar, and it is unnecessary to describe them. It will suffice to say that the old trouble in the way of heating has been overcome, in a large measure, by fitting a fan to the armature shaft, which ventilates the armature windings. As the motors are series-wound, the speed increases considerably when the tool is removed from the work, with the result that the fan delivers at these periods a large volume of air. For many classes of work, the scheme of combining the motor with the tool leaves little to be desired. Since aluminium can be used in the construction of some of the mechanical parts, powerful tools can be made without undue weight. When large powers are required, however, power from a motor can be transmitted to the tool through a flexible shaft. The motor can then, of course, have any desired capacity, for it can be mounted on a truck to facilitate its removal from place to place. The weight of the motor in this case does not count. Upon the other hand, a certain amount of power is lost in the flexible shaft, hence the efficiency of the unit is not so high as when the tool and motor are combined. But when a powerful motor is required for drilling, grinding, or other work, the flexible shaft arrangement enables such a motor to be employed.

There is, it seems, a considerable field for portable electric tools and small motor applications in garages where motor-cars are cleaned and repaired. For inflating tires, for instance, the use of small motor-driven air compressors might be encouraged. Incidentally, compressed air is also useful for cleaning upholstery. For heating garages, moreover, there is nothing safer or cleaner than an electric heater, so that altogether motor garages would appear to offer excellent opportunities for the sale of electrical energy. So far, the majority of motor-car repairers in this country have failed to recognise the ways in which electricity can be used in their business, and steps ought to be taken to enlighten them.

IMPORT TRADE OF CHINA.

THE Chinese Imperial Maritime Customs have just issued a volume giving the countries of origin of the principal imports into China during 1913-15. The following figures, showing the value of imports in 1914 and 1915 of goods of interest to the electrical engineering industry, have been extracted from this volume, and the increases and decreases shown. It is to be noted that the average value of the Haikwan Tael in 1914 was 2s. 8¾d., and in 1915 was 2s. 7½d.

	Hk. Tls. 1914.	Hk. Tls. 1915.	Hk. Tls. Inc. or dec.
Machine belting.—			
From Great Britain ...	144,000	198,000	+ 54,000
,, Germany	31,000	—	– 31,000
,, Belgium	7,000	—	– 7,000
,, France	500	—	– 500
,, Russia	16,000	9,000	– 7,000
,, Japan	57,000	64,000	+ 7,000
,, Other countries ...	30,500	86,000	– 55,500
Total	286,000*	357,000†	+ 71,000

* Includes 8,000 Hk. Tls. re-exported.
†Includes 2,000 Hk. Tls. re-exported.

Electrical materials and fittings.—			
From Great Britain ...	736,000	404,000	– 332,000
,, Hong-Kong ...	244,000	260,000	+ 16,000
,, Germany	735,000	1,000	– 734,000
,, Belgium	71,000	8,000	– 63,000
,, Italy	30,000	20,000	– 10,000
,, Japan	688,000	845,000	+ 157,000
,, United States ...	135,000	285,000	+ 150,000
,, Other countries ...	154,000	262,000	+ 108,000
Total	2,793,000*	2,085,000	– 708,000

* Includes 37,000 Hk. Tls. re-exported.

Asbestos.—			
From Great Britain ...	24,000	33,000	+ 9,000
,, Germany	8,000	—	– 8,000
,, Belgium	16,000	—	– 16,000
,, Russia	16,000	24,000	+ 8,000
,, Japan	19,000	16,000	– 3,000
,, Other countries ...	9,000	8,000	– 1,000
Total	92,000	81,000	– 11,000

	Hk. Tls. 1914.	Hk. Tls. 1915.	Hk. Tls. Inc. or dec.
Aluminium, manufactures of.—			
From Great Britain ...	2,500	1,000	– 1,500
,, Germany	5,000	—	– 5,000
,, Belgium	1,500	—	– 1,500
,, Russia	2,000	1,000	– 1,000
,, Japan	22,000	7,000	– 15,000
,, Other countries ...	2,000	—	– 2,000
Total	35,000	9,000	– 26,000
Copper wire.—			
From Great Britain ...	7,000	3,000	– 4,000
,, Germany	29,000	—	– 29,000
,, Belgium	1,500	—	– 1,500
,, Japan	143,000	123,000	– 20,000
,, Other countries ...	6,500	12,000*	+ 5,500
Total	187,000*	138,000*	– 49,000

* Includes about 5,000 Hk. Tls. re-exported.

Copper, bars, rods, sheets, plates, and nails.—			
From Great Britain ...	12,000	11,000	– 1,000
,, India	3,000	3,000	—
,, Germany	4,000	—	– 4,000
,, Belgium	13,000	—	– 13,000
,, Japan	542,000	81,000	– 461,000
,, Other countries ...	11,000	22,000	+ 11,000
Total	585,000	117,000	– 468,000
India-rubber and gutta-percha manufactures.—			
From Great Britain ...	40,000	31,000	– 9,000
,, Germany	9,000	—	– 9,000
,, France	14,000	21,000	+ 7,000
,, Russia	186,000	90,000	– 96,000
,, Japan	47,000	202,000	+ 155,000
,, Other countries ...	34,000	41,000	+ 7,000
Total	330,000*	385,000	+ 55,000

* Includes 58,000 Hk. Tls. re-exported.

Telegraph and telephone materials.—			
From Hong-Kong ...	97,000	79,000	– 18,000
,, Great Britain ...	59,000	171,000	+ 112,000
,, Germany	224,000	—	– 224,000
,, Belgium	56,000	—	– 56,000
,, Japan	78,000	65,000	– 13,000
,, Other countries ...	53,000	95,000	+ 42,000
Total	567,000*	410,000	– 157,000

* Includes 32,000 Hk. Tls. re-exported.

Railway carriages and wagons, including tramcars.—			
From Great Britain ...	603,000	100,000	– 503,000
,, Germany	75,000	—	– 75,000
,, Belgium	1,470,000	10,000	– 1,460,000
,, Russia	28,000	13,000	– 15,000
,, United States ...	86,000	172,000	+ 86,000
,, Other countries ...	78,000	335,000	+ 257,000
Total	2,340,000*	630,000	– 1,710,000

* Includes 117,000 Hk. Tls. re-exported.

NATIONAL INSURANCE (UNEMPLOYMENT) ACTS 1911 TO 1916.

UNEMPLOYMENT INSURANCE.

Decisions by the Umpire.

CONTRIBUTIONS ARE PAYABLE IN RESPECT OF:—

2,088 X. All workmen engaged wholly or mainly in sawmilling or machine woodwork, whether in connection with insured or uninsured trades or independently, with the exception of those already insurable under Part II of the National Insurance Act, 1911.*

487 X. Workmen engaged in the installation or erection of accumulators in buildings, ships, or vehicles.

(This involves reconsideration of Decision 1,962 X.)

NOTE.—Decision 1,962 states that the Umpire has decided that contributions are not payable in respect of:—

Workmen described as out-door erectors and engaged wholly or mainly in the installation of accumulators.

CONTRIBUTIONS ARE *not* PAYABLE IN RESPECT OF:—

2,087. Volunteer workers employed on munitions work in their spare time and engaged for less than the normal factory hours of the place where they work, provided that they are:—

1. Free to come and go or stay as they please.
2. Are not dependent upon earnings at munitions work.
3. Are not badged in respect of the munitions work.

* The term "sawmilling and machine woodwork" includes the cross-cutting, boring, turning, polishing, or sandpapering of wood by power-driven machinery.

COLONIAL TELEGRAPHS AND TELEPHONES.

By R. W. WEIGHTMAN, M.I.E.E.

(*Abstract of paper read before the* INSTITUTION OF ELECTRICAL ENGINEERS.)

(*Continued from page* 713.)

ENGINEERING.

There is practically no overhouse construction in any of the Dominions or Colonies, and the chief difference in the construction of pole lines lies in the character of the pole employed. Where timber is plentiful and there are no local drawbacks to its use, wood poles are the rule, but where it is scarce or not of suitable size or quality, or where it is liable to be attacked by white ants, or destroyed by grass or bush fires, iron poles are used.

White ants abound in practically all the tropical Colonies, and while it is usual in such countries to find an indigenous wood which is more or less immune from their attacks, like the teak-wood of Burmah, the cedar of British East Africa, and the sneeze-wood of South Africa, it is not always suitable for use as telegraph poles.

There are two types of tubular iron poles with cast-iron bases and wrought-iron taper upper tubes in general use in the Crown Colonies. The advantage in the tapering top is that it combines strength with lightness. The taper is lap-welded in machines specially designed for the purpose. In the original joint the space between the tube and the base was filled with a sulphur-oxide-of-iron cement, but in nearly all poles ordered now either the screw ring joint, or the taper ring joint is used. The author prefers the latter because it fits automatically, and it eliminates two items from the stores list, namely, the separate screw ring and the screw-ring spanner.

In all these poles the cast-iron base is of sufficient length to keep the wrought-iron tube out of the ground when the pole is planted to its proper depth. The depth of the socket varies from 6 in. in a 20-ft. pole to 12 in. in a 30-ft. pole.

All cast-iron bases were originally made without the wrought-iron band which is now shrunk on to the top end of the base. Before the band was brought into use it was a common thing for a base to split at the socket in cold, gusty weather, but the band entirely prevents this.

The top end of each pole is bossed and a wrought-iron lightning rod about 18 in. long by ½ in. diameter is usually driven into a tapered hole in the boss. Sometimes, however, an insulator spindle is screwed in, but this is a practice not to be recommended. Where lightning storms are frequent the insulator runs great risk of being struck, and in any case a wire running along the tops of poles is very much in the way of the lineman.

One type of pole has its base pointed, the point being solid for about 5 in., so that it can be driven into the ground by means of a special rammer which is dropped inside the base. A wooden disk about 2 in. in thickness is first put into the base to take the impact of the blows from the rammer off the cast iron. Where the ground is at all sandy or marshy a ground plate can be used. It is slipped over the bottom end of the base and wedges up against a narrow bead on the casting about 12 in. from the top. This pole will carry a horizontal load of about 80 lb. at a point 12 in. from the top.

The standard type of pole used has a cylindrical cast-iron (parallel) base with square flange at the bottom end to which a buckled base plate is bolted.

Poles of this type are made in a number of standard lengths and strengths. Where the length is 40 ft. or over, the upper part is made in two or more sections. The cast-iron bases and buckled plates are usually dipped in Angus Smith's compound, while the tubes are dipped while hot in hot linseed oil. A factor of safety of 2 based on a wind pressure of 17 lb. per square foot is sufficient for these poles in countries where there are no snow and ice accumulations to be taken into account. Where snow and ice occur a factor of safety of 4 should be allowed.

The cast-iron bases used in South Africa have circular flanges at their bottom ends, with four strengthening webs extending from the flanges about 18 in. up the base. This flange is of larger area than the square flange, and can be used without a base plate where the ground is sufficiently firm. Fig. 1 shows a light pole specially designed for South Africa. It is used on farmers' lines and carries one or two pairs of wires between main routes and the homesteads. It is 18 ft. in length and has a wedge joint. It will carry wires having a total lateral stress of about 80 lb., 12 in. from the top. It is probably the lightest and cheapest pole used in telephone practice anywhere. The upper tube is high-grade steel galvanised, and the lower section is cast iron. The cap is of cast-iron and the lightning rod wrought-iron. The bracket, spindle, and insulator used with this pole are also shown in the figure.

There is a parallel pole of a more ornamental type which is used for special street work in South Africa. There is no cast-iron base with it, but it is protected from corrosion at the ground line by means of a sleeve which is shrunk on. It is 26 ft. in length, and will bear a maximum load of about 300 lb. at the top when planted 4 ft. in the ground. Where poles of similar type have been planted without the sleeve protection, corrosion has often taken place at and above the ground line. This has been prevented by the use of cast-iron sleeves made in two longitudinal half-sections with their edges overlapping. When the two half-sections are screwed together they have a neat cylindrical appearance. The small space between the sleeve and the pole is caulked with yarn and red lead and painted over.

In some of the Crown Colonies tubular poles of the type introduced by the Indian Government, and known as the Hamilton pole are used. These consist of riveted tubes of steel sheet fitting into cast-iron sockets having cast-iron sole plates. A full-length pole is about 58 ft. out of the ground, and comprises eight sections, each 8 ft. long. The poles taper from about 12 in. at the bottom to 3 in. at the top. They are jointed together by the upper tube in each case being driven over the next lower one, and each joint is strengthened by a stiffening hoop shrunk on. Each section has its own cast-iron socket with sole plate, which is known by the letter corresponding with the tube it fits. The sole plate screws on to the socket. The top of the pole is fitted with a cast-iron cap with lightning rod, which is driven into the top of the tube. The above-ground parts are always galvanised, while the sockets and plates are dipped in Angus Smith's compound.

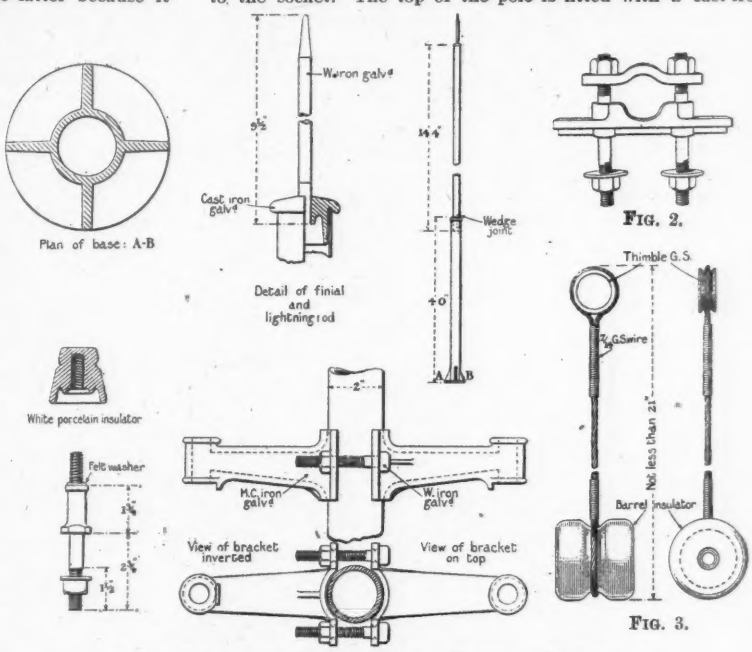


FIG. 1.—LIGHT POLE WITH DOUBLE BRACKET, SPINDLE, AND INSULATOR (SOUTH AFRICA).

FIG. 2.

FIG. 3.

FIG. 2.—COMBINATION BRACKET WITH SHOULDER BOLTS FOR TUBULAR IRON POLE.

FIG. 3.—BARREL INSULATOR WITH SLING (AUSTRALIA).

The number of poles to the mile varies with the class of line, from 20 to 40 to the mile. The author has had experience of spans up to 800 yds. in length over rivers and ravines standing quite satisfactorily for many years. Hard-drawn copper wire was used on spans up to 300 yds., whilst above that length bronze was used. Copper wire can be fully relied upon for long spans so long as a reasonable factor of safety is allowed. In a country where snow is almost unknown this may be as low as two, but it should include full allowance for wind pressure. The poles are specially stayed, double width spacing is given on the arms, only one quality and gauge of wire is erected, every care being taken to adjust all the wires to the same dip, and no joints are made in the spans. With these precautions the wires all swing in unison and there is no trouble.

The stays used throughout these countries are of British Standard types with tighteners and with iron anchor plates, which are usually tarred. Where the stay wire is fixed to an iron pole it is made off over a special clip. It is bad practice to fix it over an arm or bracket, as is often done.

Where iron poles are employed near the sea they can only

be preserved from corrosion by being frequently painted or tarred. The author has tried every kind of paint for this purpose, but he found none to stand any better than coal tar applied in the heated state. It is much cheaper than paint, and where native painters do the work the waste which is inevitable is not so serious a loss.

Discarded railway rails are used at certain places, the rails being set with the web of the rail at right angles to the direction of the line. Planted the other way about they are liable to bend over in very windy weather.

In Canada wood poles and arms obtained from timber grown in the country are used on both telegraph and telephone lines. There are no iron or reinforced concrete poles in use. The poles are generally of cedar. They are generally cut to an apex at the top, the apex being at right angles to the arm, but they are not fitted with pole roofs.

The practice in respect of the providing of earth wires on poles varies, but it is nowhere the rule to earth-wire every pole.

At road and railway crossings poles of suitable length are used to give clearances of 16 ft. over roads and 25 ft. over railways when the ultimate lowest cross-arm has been fitted. A clearance of 3 ft. is allowed either over or under when the wires of another administration are crossed.

In Australia both wood and iron poles are used, the selection depending generally upon whether or not dangers from white ants or bush fires have to be met. Several types of iron poles are employed, the principal being the Siemens taper pole with cast-iron base and screw ring joint. For light lines the Oppenheimer iron pole, iron tubing, and old railway rails are also used. The Oppenheimer pole has a cast-iron base shaped like a dart, with moderately sharp cutting edges, which permit of its being driven into the ground. In the upper part a socket is formed into which the wrought-iron tube is fixed by means of iron wedges.

All the wood poles used are obtained from trees indigenous to the country. In districts infested with white ants all poles are protected from their attacks by the application of a solution of arsenic (1 lb.) and caustic soda (2 lb.) dissolved in one gallon of water. The pole is well coated with this mixture by means of a long-handled tar brush for a distance of 18. in. above and 18 in. below the ground-level. The solution is given a few hours in which to soak into the timber, when it is given a coating of coal tar composition consisting of gas tar (7 parts), Stockholm tar (3 parts), and fresh-slaked lime (3 parts). The ground for a distance of 1 ft. around the pole is well sprinkled with the exterminator, and this is covered with 9 in. of unpoisoned earth. Another method is to bore one or more holes with a $\frac{3}{4}$ in. auger in a downward direction to the centre of the pole, and to fill the holes with the exterminator, the holes afterwards being plugged with hard wood plugs which are gently driven in and then cut off flush with the pole.

The minimum height from the ground of the lowest wires along the road is 12 ft., and at the road crossings 18 ft. All wood poles are provided with lightning conductors of No. 8 galvanised iron wire fixed with staples 2 ft. apart. The top of each pole is cut to an apex, which is placed at right angles to the line. It is coated with coal-tar composition and fitted with a galvanised iron roof of sufficient size to project 2 in. beyond the pole on all sides.

New Zealand has a greater variety of types of poles than most countries. Poles of wood, tubular iron, reinforced concrete, and discarded railway rails are in use. The wood poles are mainly got from indigenous trees. There are no white ants in New Zealand, and poles are but rarely damaged by fires. The poles are not earth-wired.

Tubular iron and steel poles have come more into use within the past few years. They are of both solid drawn and lap-welded types, although not of the standard taper pattern so much employed in South Africa and other countries. They are used in the larger towns for telephone exchange distribution purposes, also in the lighter sizes on some light country lines, where it is advantageous to use them owing to the ease with which they can be transported and handled over rough country.

The reinforced concrete pole used is of solid construction, the cross-section being rectangular. When erected the longest side of the pole is placed at right angles to the line, a factor of safety of 2.5 being allowed. Hollow concrete poles are not employed.

Poles of 52-lb. and 70-lb. discarded railway rails are largely used, and are said to make splendid lines. Where extra strength is required, as at angles, two rails with their flanges bolted together are often used, and where a line is required to be specially strong every fifth pole is doubled in this way. Poles of this type have been used for a great many years, and are so favoured that they would be in general use but for the fact that they are not available in the quantities required. Special castings are made to attach the arms to these poles.

POLE FITTINGS.

There are many types of iron brackets and arms available for use with iron poles, and South Africa may take some credit for having helped to evolve a number of useful improvements to these fittings.

The bracket shown in fig. 1, p. 25, is of malleable cast iron. It is typical of many other patterns which vary mainly in the size of the seat. A similar bracket is made for four wires. For one wire only a single bracket with a back strap is used. On this bracket there is a small projection which locks the spindle nut, and so prevents it from getting loose owing to vibration.

For a wood arm Jobson's combination bracket is a useful fitting. This was originally made with straight fixing bolts, and it is still used in this form by some administrations. In South Africa it gave much trouble owing to the arm shrinking in dry weather and causing the clamp to become loose. On angle poles this often allowed the arm to cant, and even to twist right round. To prevent this, and to enable the clamp to be tightened up on the pole independently of the arm, the author's old chief in Natal, the late Mr. T. T. Hardaker, devised the shoulder bolt shown in fig. 2. With this bracket the clamp is first tightened up against the shoulders of the fixing bolts, and not till this is done are the nuts on the arms screwed up. This improvement made the Jobson bracket a thoroughly reliable one, and many thousands have been used in South Africa and elsewhere.

With the introduction of the tubular iron arm by the Post Office in England several of the Colonies quickly took it up, and with some of these it is now the standard arm.

Tubular arms are made of different diameters and thicknesses of iron, but the sizes most commonly used are all 1 11/16 in. diameter by Nos. 7, 9, and 12 S.W.G. thick. They are always galvanised. Tests show that the No. 9 gauge tube is sufficiently strong for all practical purposes.

If line construction is good the maintenance costs will be low, and the great advantage of freedom from faults is gained. Loss of time to telegraphists, delays to telegrams, and annoyance to subscribers to telephone systems which result from interruption to wires are reduced to a minimum if the constructional work is of the best. Probably in no other class of engineering is the success of a work dependent upon factors of such low values mechanically as in telegraph and telephone engineering. A telegraph line may be 1,000 miles in length, and its good working depend not only upon a thin wire having a breaking strain of 500 or 600 lb., but even more so upon scores of little joints and connections spread over its entire length. Good materials, properly standardised for the different classes of lines and work, and good workmanship are of the greatest importance. They may cost more initially, but they pay in the end.

Double-shed white porcelain insulators of Post Office types are generally used in these Colonies and in South Africa. On the farmers' lines in South Africa and on some lines in British East Africa a small single-shed porcelain cup is used. It is quite a satisfactory light line insulator for use where the climate is dry. The spindles and cupholders used with these cups are generally of the standard types adopted by the British Engineering Standards Committee.

Black insulators of the large P.O. pattern made from a bituminous composition have been given a trial in several of the Colonies, but are not highly spoken of.

Glass insulators, so much used in the United States and Canada, where the climate is dry, are not used to any extent in the Crown Colonies, and not at all in South Africa. The inferior insulation of glass as compared with porcelain has been against its adoption. Some insulation tests of porcelain and glass insulators of the same size and shape, carried out for the author recently, gave an average of 50,000 megohms for the former and 3,500 for the latter. Glass insulators are much affected by changes of temperature, and are liable to fly to pieces even when these changes are comparatively slow. In India, where glass insulators were tried, they had to be abandoned because of this weakness. Porcelain insulators are less affected by temperature changes. They are tougher, and when used in the standard manner on screwed spindles with elastic washers of felt or india-rubber they are quite reliable. Felt washers are generally used to-day. They are cheaper than rubber and equally efficient. Where porcelain insulators are fixed to the spindles by a non-elastic cement they are liable to be shattered during rapid changes of temperature. Porcelain insulators of Continental make have been used in some of the Colonies, but they are extremely brittle, and it is no uncommon thing for the internal threads to be completely broken away by the swaying of the line wire after the insulators have been in use a few months. The insulation of a line is a matter of the first importance. The best insulator gives the best service, and the author is prepared to say that no insulators made are to be compared either for insulation, strength, or general serviceableness with the British Post Office standard porcelain types as made in England.

In Canada both porcelain and glass insulators are used on both telegraph and telephone lines; but, owing to the wonderful dryness of the climate, glass is found to give sufficient insulation in most localities and is largely used, mainly in the single-shed form. Where high insulation is required on both telephone and telegraph circuits, as on long-distance lines and in wet districts, porcelain is used. The insulators are usually held on wood pins, screwed with a large thread to take a corresponding thread in the insulator. This pin has a tapering shank which fits rigidly into the hole in the arm. In some cases a steel pin is used with iron washer and nut at the arm end, and with a wood thimble on the top end to take the insulator.

In Australia wood arms and single iron brackets are used on both wood and iron poles.

The standard insulators used are of porcelain or stoneware

of double-shed type and made in two sizes. They are threaded internally and are usually carried on wood pins similarly threaded, although iron spindles with lead-screw tops are also used. The wood pins are made to fit tightly into the wood arms. Where there is a possibility of the wire lifting the pins out of the arm or bracket a piece of 200-lb. galvanised iron wire is passed through a hole in the shank of the pin, and the ends are twisted together.

The "cheaply constructed line" is a novel feature authorised by the Commonwealth Department. Such a line is only erected when the cost of a standard pole line is prohibitive, and it is erected on trees, saplings, scantlings, and fences. Owing to the low efficiency of the insulation this class of line is used almost exclusively for local telephone services. Where saplings are used they must not be less than 12 ft. long and 3½ in. in diameter at the top end. Scantlings must be of hard wood not less than 2 in. by 3 in. in section and 10 ft. long. Swan-neck spindles with pattern A or B insulators are the standard on straight sections of line. Where the wire is attached to a tree a sling insulator as illustrated in fig. 3 is used. This is bound to the tree by means of a strand of four No. 14 gauge galvanised iron wires which is passed through the hole in the barrel insulator, and the tension on the wire is always in such a direction as to draw the insulator away from the tree. Similar slings 12 in. in length are used on angle poles. Where the wire is carried on fencing posts barrel insulators of the same type are employed. They are fixed with spikes, and the wire is taken over the top of the insulator and bound thereto.

In New Zealand the insulators used are of standard Post Office white porcelain types, the large size on heavy lines and the small size on exchange distribution work. Iron arms are not used.

(To be continued.)

DISCUSSION.

Col. A. M. J. OGILVIE, in opening the discussion, said the paper was an excellent supplement to Mr. Preece's paper on a similar subject, and covered the general standard practice of a number of Colonies. It was extraordinary what difficulty was met with in Colonial telegraph work, in keeping abreast of standard practice and in getting the best equipment, and this revealed a weak point in our national organisation, which should be overcome after the war. Steps were being taken in this country before the war to secure general standardisation, and the idea should be extended to include the Colonies after the war.

Mr. LLEWELLYN PREECE said the paper told of practice throughout the world, and it would be welcomed by colonial engineers as an assistance in overcoming their difficulties. The most important section, he thought, was on administration; engineers were not often interested in it, but it was most important that they should study it. The engineer, purely, was of little use in the higher positions, which became more and more managerial. The New Zealand telephone department in the early days used to char the butts of the poles, but in one case a contractor forgot to do this, and ten years after, investigation showed that the only poles which were not falling down were those which were uncharred, and as a result it was decided to abandon the practice of charring. In regard to pole life, an instance occurred to him of poles which had been standing 38 years being found in good condition, and moved for use again. These poles had been erected only six weeks after they were growing, and their life was unprecedented in this country.

Mr. F. R. MCBERTY said that in Western Canada and New Zealand telephonic development had been very rapid; in New Zealand machine switching had been largely adopted, and as a result of the extensive progress the telephone saturation in the Dominion was 5 per cent., and in individual cities it was 8 or 9 per cent. It was decided to adopt automatic switching in 1912, and contracts had been entered into for about 30,000 lines. These developments would in a short time result in one area having the largest automatically-worked system in the world. A reason for automatic working was high wages, but the main purpose in view was the improved quality of the service—not economy, although it was estimated there would be from 25 to 50 per cent. saving.

Sir WM. SLINGO said he felt exceedingly proud that engineers the world over could fall back on British Post Office practice. In this country there had been poles 40 years in one position, but the average was much less, as most poles were removed before their utility ceased, to make room for larger ones, or in the course of alterations. The question of waiting for material in the Colonies would not arise if a reserve stock were carried; in this country the P.O. held a large stock based on one year's consumption. Not many iron poles were used here, as they were not necessary. He asked why experiments were made with solid as against tubular reinforced concrete poles.

Mr. E. O. WALKER asked whether aluminium wire was used at all; he considered iron wire preferable to copper or bronze in tropical conditions, as if a tree fell on iron wire and brought it down, it was still possible to work through it.

Mr. A. MOIR said three types of cable joints were employed in telephone work: the air space joint, the boiled-out joint—which was not a solid joint, there being space for air to pass—and the solid joint, which was hermetically sealed. All engineers were agreed about the latter; it was usually introduced at the end of an air-space cable before the wires spread out at the exchange. He thought the air-space joint had some virtues; in crowded city streets there were considerable risks in handling the boiled-out joint, though it might be quite safe on a country road. The practice in desiccation in this country was to apply it at the point of trouble; originally the plant was installed at the exchanges, but it was found not to have a very efficient range.

Mr. CRAWTER could not understand anyone complaining about the complexity of an ordinary lighting job, when familiar with automatic telephone plant. Colonial engineers were to be congratulated on the life of their storage plant; personally, he thought it better to charge from the mains than use a motor generator in the small sizes.

Mr. C. C. F. MONCKTON, speaking as a visitor from Fiji, thought that some variation might be required in standard methods in each Colony due to labour and climatic conditions. As regarded delays in delivery of material, in Fiji it was at least a year before it was received, and work thought out in 1912 was finished in 1914 or 1915. They had separate telegraph and telephone departments. Labour was expensive, and hurricanes were frequent, but a governing factor was the poor house construction. Iron-bark poles were used, and some lasted 15 years; in narrow streets the lines were carried on iron brackets attached to balconies. During hurricanes, the galvanised roofs were often blown off, and in their flight would cut through whole groups of wires, so an attempt was being made to use cable instead of numerous wires. In the country tubular metal poles were used instead of iron-bark poles, being lighter to transport. It was found that no creepers grew up the square iron-bark poles, but if a stay were put up, the creepers had to be cleared off it about once a month. The Siemens vacuum arrester was used for protection against lightning.

Mr. D. H. KENNEDY assumed from his remarks on Canada that the author commended the dry-core joint; in London they had some doubt as to the boiled-out joint. The cost of desiccating in a large city was considerable for air-space joints.

Mr. W. AITKEN believed he was the first to point out the need of a leading-in insulator, but it seemed that with two wires on the same insulator, its function of preventing leakage might be defeated. He did not believe in giving the telephone subscriber anything to do after he had got his connection, and he thought it was a mistake to ask him to depress a key when he had finished, as was the practice in some cases. The American train dispatching telephone system in a modified form had, he thought, been adopted in English railway practice, but not for train dispatching.

Mr. FRANK GILL said, as regarded joints, the boiled-out type was far ahead of the dry joint. It would stand more bad usage than the latter, and did not develop its faults; they could, therefore, do without expensive drying-out plant, which was, or should be, idle most of the year.

Major A. C. BOOTH expressed surprise at the use of the barrel insulator (in Australia); it had dropped out of home practice. All the systems of high-speed apparatus were now in competition, and it was very interesting to hear anything about them; figures as regards maintenance ought to be available now. The only difference between the Baudot system in use in Ceylon and home practice was that it was worked duplex.

Mr. H. W. PENDRY said the Baudot system in Ceylon just doubled the duty which was originally intended. The alphabet was very simple, and it was found that operators began to pick it up in a few hours, and became skilled in three months.

Mr. G. F. MANSBRIDGE thought it rather hard to talk about the dilatoriness of the manufacturer in forwarding material, because this was often different in some slight detail from the usual standard article; he hoped the paper would lead to some better understanding of the conditions. He did not consider that increased power would help the Wheatstone apparatus, which was driven by clockwork.

Mr. J. E. KINGSBURY also drew attention to the manufacturing side and the demand for special articles, &c., suggesting that he would like to see engineers devote attention to seeing what special modifications could be made to meet the required conditions, rather than that they should agree to accept things for better or for worse.

Mr. E. T. WILLIAMS said that in some Eastern Colonies the typhoons brought down the best constructed lines. He had found that lead-covered wires used in rooms, where the walls ran with moisture, overcame many of the usual troubles in such situations. The Chinese stole copper or bronze wire, and so it was not often used there. In North China there was intense cold and much humidity; the wires got very big owing to the frost, and this was worse than snow. He recollected a cable laid in a Chinese harbour which was specially designed to hold the largest junk which dragged its anchor.

Lieut. MCARTHUR said the functional organisation in South Africa had been found very successful indeed. He was afraid there was still doubt as to the actual protector to adopt for lightning protection, but so far the carbon-vacuum protector was the best for inside use. With long-distance lines in South Africa it was found that they could have too much protection. The Germans had also adopted the carbon-vacuum protector in conjunction with other apparatus in German West Africa.

The author, owing to the lateness of the hour, commented very briefly on the discussion.

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

UNITED KINGDOM—FRANCE.—The text of an Agreement between this country and France, respecting trade with Morocco and Egypt in transit through British and French Territories in Africa, has recently been published by the Foreign Office. Copies of the Agreement (Treaty Series No. 7 of 1916) can be obtained price ½d. (post free 1d.) from H.M. Stationery Office, Imperial House, Kingsway, W.C.

FRANCE.—A recent Presidential Decree provides that, as from January 1st, importers of goods produced in or exported from foreign counties must state in their Customs declarations the names and addresses of the persons for whom the goods are intended, and must indicate whether the goods are or are not destined for Government supplies, or work on account of the State. The Customs Authorities may demand the production of the waybills, shipping documents, invoices, &c., to check the accuracy of the statements made.

SWEDEN.—The exportation of sal ammoniac has been prohibited as from December 1st, and of lead packings as from December 9th.

ARGENTINA.—The procedure to be adopted in the case of under-valuation of imported goods has been laid down by a recent Presidential Decree, which provides that when there are presented for clearance goods which are not covered by any heading in the Valuation Tariff, and on which, therefore, duty is leviable on the declared value, such goods shall, if in the opinion of the Customs Appraisers the declared value is less than the real value, be retained by the Fiscal Authorities, and there shall be paid to the importer the declared value of the goods increased by 10 per cent.

The Decree also provides that in the case of goods dutiable according to the declared value, the Customs authorities are not to allow any application for direct clearance or for warehousing to go forward unless the consignees of the goods make a signed statement at the foot of the respective documents to the effect that they agree with the value declared.

A long over-due improvement in the conditions under which commercial travellers may exercise their calling in Argentina is foreshadowed by a Bill which was presented to Congress by the late Government of the Republic. In place of the 15 separate licences which are at present required in order to cover the whole country, the Bill proposes the use of a single licence, to be valid for one year from the date of issue. If only one branch of trade is represented the licence fee will be 400 pesos (£35), with an addition of 200 pesos for each additional branch, the maximum fee payable being 1,000 pesos (£87 10s.), which will entitle the holder of the licence to do business in all branches of trade.

Provisions are also included in the Bill to the effect that samples, sample cases, and patterns brought from abroad may be cleared through the Custom House by the presentation of a written application, stating complete and minute details of the goods, a bond being given for the value of the duties, to hold good for 30 days.

PERU.—New export duties on rubber exported *viâ* Madre de Dios and Mollendo are imposed by a recent Presidential Decree, as follows:—

Rubbers of which the price quoted in London fluctuates between 25d. and 36d. per lb.	2 per cent.
Do., do., 37d. to 40d. per lb.	4 per cent.
Do., do., 49d. or more per lb.	6 per cent.

The tax is to be assessed on 70 per cent. of the value of the rubber exported. Ordinary rubber is to pay duty on the same scale, with a reduction of 30 per cent., calculated on the 70 per cent. paid by fine rubbers.

BRAZIL.—His Majesty's Minister at Rio de Janeiro reports the inclusion in the Budget Bill for 1917 of a provision to the effect that a fourth copy of Consular invoices for shipments of merchandise to Brazil is to be made out, and forwarded by Brazilian Consuls to the Custom House of the port of destination.

MEXICO.—A copy of the official edition of the new Mexican Customs Tariff, which came into force on November 1st, has been received at the Board of Trade. This edition comprises (1) the text of the revised Tariff, (2) General Rules for its application, (3) Explanatory Notes, and (4) an Index. Particulars of the rates of duty payable on electrical goods were given in the ELECTRICAL REVIEW of November 17th. These rates are correct with one exception, viz., the duty on "belts for machinery, of rubber, and of tarred cotton or hemp," which should read 25 centavos per kilog. gross instead of 20. The duties are fixed in national gold, and in payment thereof only national gold or American dollars will be accepted. In cases where payment is made in American currency, the American dollar will be received as the equivalent of two pesos national gold. If payment is made in Mexican silver, the Mexican peso will be received at its par value. The smaller silver currency will, however, be received at the rate of 90 centavos for each peso national gold.

A complete translation of the General Rules for the application of the Tariff appears in the *Board of Trade Journal* for December 21st, while the official edition of the Tariff (in Spanish) may be consulted at the Department of Commercial Intelligence.

NEW PATENTS APPLIED FOR, 1916.

(NOT YET PUBLISHED).

Published expressly for this journal by Messrs. W. P. THOMPSON & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford.

18,113. "Galvanic cells." R. SCHUSTER. December 18th.

18,144. "Magnetos with fixed armatures." E. C. R. MARKS (Soc. Anon. des Etablissements L. Blériot). December 18th.

18,145. "Terminals for electric wires." BURNEY & BLACKBURNE AND E. M. COBB. December 18th.

18,158. "Electric lampholders." H. GARDE. December 18th.

18,160. "Arrangement for automatically advancing ignition in explosion engines." SOC. ANON. POUR L'ECLAIRAGE ELECTRIQUES DES VEHICULES. December 18th. (France, December 29th, 1915.)

18,173. "Electric telegraphs." R. M. SAYERS. December 19th.

18,184. "Insulating, &c., slabs or units." J. DAVIES & W. H. JONES. December 19th.

18,193. "Protective devices for electric circuits." BRITISH THOMSON-HOUSTON CO. (General Electric Co., U.S.A.). December 19th.

18,194. "Ignition magnetos for internal-combustion engines." ARINGDON-ECCO, LTD., & G. B. BIANCO. December 19th.

18,208. "Dynamo-electric machinery." A. H. NEULAND. December 19th.

18,225. "Flash-lamp shade." H. S. LITTLEHALES. December 20th.

18,238. "Combined carton and shade for electric incandescent lamps." W. G. NEWBERRY. December 20th.

18,255. "Electric voltage regulation." B. DAVIES & EASTERN TELEGRAPH CO. December 20th.

18,257. "Electric switches for switchboards, &c." A. H. MIDGLEY & C. A. VANDERVELL & Co. December 20th.

18,285. "Electrical generator, motor or motor transformer." E. L. DAVIES. December 21st.

18,287. "Apparatus for electro-deposition of metals." F. R. TUBBS. December 21st.

18,300. "Automatic telephone systems." AUTOMATIC TELEPHONE MANUFACTURING CO. December 21st. (U.S.A., December 31st, 1915.)

18,301. "Protective devices for electric circuits." BRITISH THOMSON-HOUSTON CO. (General Electric Co., U.S.A.). December 21st.

18,307. "Operating electric switches from a distance." A. H. FRANCKS AND TELEPHOS DOMESTIC & STREET LIGHTING CO. December 21st.

18,323. "Manufacture of filaments for incandescent electric lamps." WESTINGHOUSE METAL FILAMENT LAMP CO. (Westinghouse Lamp Co.). December 21st.

18,324. "Distribution boards." SOC. ANON. POUR L'ECLAIRAGE ELECTRIQUE DES VEHICULES. December 21st, 1916. France, January 21st.)

18,341. "Electric motor mechanism." G. JONES. December 21st.

18,366, 18,367. "Hand-driven portable dynamo-electric machines." A. E. ANGOLD & A. H. RAILING. December 22nd.

18,374. "Electro-pneumatic brakes for railway vehicles." E. H. DEWSON. December 22nd. (U.S.A., June 1st.)

18,381. "Device for electrically controlling helms of ships." FIAT-SAN GIORGIO SOC. ANON. December 22nd. (Italy, December 22nd, 1915.)

18,386. "Aerial conductors." G. PLAISANT. December 22nd.

18,387. "Dynamo-electric machines." G. PLAISANT. December 22nd.

18,389. "Safety apparatus for preventing increases of potential in electric installations." E. C. R. MARKS (Uytborck). December 22nd.

18,398. "System of X-ray tube operation." G. R. HOGAN & H. P. MACLAGAN. December 22nd.

18,402. "Transmission of electric currents of varying potential." M. B. RODRIGUEZ. December 22nd.

18,411. "Method of operating electrodes for searchlights." E. A. SPERRY. December 22nd. (U.S.A., December 22nd, 1915.)

18,423. "Current-saving devices for electric welding." C. ROULLAND. December 22nd.

18,425. "Electric transformers for electric furnaces, &c." J. BIBBY. December 22nd.

PUBLISHED SPECIFICATIONS.

1915.

12,748. DYNAMO-ELECTRIC MACHINES. H. Chitty. (Cognate application, 3,192/16.) September 6th.

14,026. ELECTRO-MAGNETICALLY-OPERATED CLUTCHES, PARTICULARLY APPLICABLE TO REVERSING GEAR FOR RECIPROCATING MACHINES. Lancashire Dynamo & Motor Co. and W. Hargreaves. October 4th.

15,555. ELECTRIC VACUUM DEVICES. British Thomson-Houston Co. (General Electric Co., U.S.A.). November 4th.

16,992. ELECTRICAL SIGNALLING SYSTEMS OR ANNUNCIATORS, CHIEFLY FOR HOTELS. International Electric Co. & R. G. le Noir. December 2nd.

16,993. ELECTRIC SWITCHES. International Electric Co. & R. G. le Noir. December 2nd.

17,000. AUDIBLE SIGNAL DEVICES. International Electric Co. & R. G. le Noir. December 2nd.

17,002. DISPLAYING STANDS OR SUPPORTS FOR VARIOUS ARTICLES. International Electric Co. & R. G le Noir. December 2nd.

17,155. ELECTRICAL ROTARY CONVERTERS. G. Schroeder. December 6th.

17,195. ELECTRO-MAGNETIC SWITCHES. British Thomson-Houston Co. (Electric Controller & Manufacturing Co., U.S.A.). December 7th. (Addition to 20,534/11.)

17,260. APPARATUS FOR REVERSING THE POLARITY OF ELECTRIC CIRCUITS FOR TELEGRAPHIC AND OTHER PURPOSES. A. Orling & Orling's Telegraph Instruments Syndicate, Ltd. December 8th.

17,265. MEANS FOR EFFECTING REMOTE CONTROL OF APPARATUS DRIVEN BY ELECTRIC MOTORS. F. A. Pickett & Igranic Electric Co. December 8th.

17,338. SIGNALLING INSTRUMENTS BASED UPON THE ACTION OF A LIQUID COLUMN CONTAINED IN A TUBE OF INSULATING MATERIAL. O. Cornaz & C. Perrin-Mercier. December 10th (November 17th, 1915.)

17,386. AUTOMATIC AND SEMI-AUTOMATIC TELEPHONE SYSTEMS. Relay Automatic Telephone Co., Ltd., & H. J. Herink. December 11th.

17,742. METHOD OF AND MEANS FOR ATTACHING FITTINGS TO SHEET METAL OR OTHER SHEET OR STRIP MATERIAL, APPLICABLE ALSO FOR REINFORCING, FINISHING, OR INSULATING THE MARGINAL EDGES OF HOLES OR APERTURES IN SHEET METAL OR OTHER SHEET MATERIALS. O. Wickham. December 18th.

1916.

The numbers in brackets are those under which the specification will be printed and abridged, and all subsequent proceedings will be taken.

203. CASINGS FOR ELECTRIC WIRES. A. K. Modi. January 5th, 1916. [102,387.]

440. MEANS FOR APPLYING ELECTRICAL TREATMENT TO THE BODY. A. Vernon-Ward. January 11th, 1916. [100,770.]